

Time: 120 Mins

Total Marks: 198

**Important Instructions**

- (i) Total Number of Questions: 66
- (ii) Number of Question in Verbal Ability and Reading Comprehension (VARC): 24
- (iii) Number of Question in Data Interpretation and Logical Reasoning (DILR): 20
- (iv) Number of Question in Quantitative Ability (QA): 22
- (v) 40 Minutes are allotted to attempt each section.
- (vi) 4 answer options for each MCQ type question
- (vii) Answers are typed in the given space on the computer screen for Non-MCQ.
- (viii) For each correct answer: + 3 marks
- (ix) Negative marking (Applicable for wrong answers in MCQs): - 1 mark

**Verbal Ability and Reading Comprehension (VARC)****Passage 1**

**Directions (Q. 1 to 4):** *The passage below is accompanied by a set of questions. Choose the best answer to each question.*  
Today we can hardly conceive of ourselves without an unconscious. Yet between 1700 and 1900, this notion developed as a genuinely original thought. The “unconscious” burst the shell of conventional language, coined as it had been to embody the fleeting ideas and the shifting conceptions of several generations until, finally, it became fixed and defined in specialized terms within the realm of medical psychology and Freudian psychoanalysis.

The vocabulary concerning the soul and the mind increased enormously in the course of the nineteenth century. The enrichments of literary and intellectual language led to an altered understanding of the meanings that underlie time-honored expressions and traditional catchwords. At the same time, once coined, powerful new ideas attracted to themselves a whole host of seemingly unrelated issues, practices, and experiences, creating a peculiar network of preoccupations that as a group had not existed before. The drawn-out attempt to approach and define the unconscious brought together the spiritualist and the psychical researcher of borderline phenomena (such as apparitions, spectral illusions, haunted houses, mediums, trance, automatic writing); the psychiatrist or alienist probing the nature of mental disease, of abnormal ideation, hallucination, delirium, melancholia, mania; the surgeon performing operations with the aid of hypnotism; the magnetizer claiming to correct the disequilibrium in the universal flow of magnetic fluids but who soon came to be regarded as a clever manipulator of the imagination; the physiologist and the physician who puzzled over sleep, dreams, sleepwalking, anesthesia, the influence of the mind on the body in health and disease; the neurologist concerned with the functions of the brain and the physiological basis of mental life; the philosopher interested in the will, the emotions, consciousness, knowledge, imagination and the creative genius; and, last but not least, the psychologist.

Significantly, most if not all of these practices (for example, hypnotism in surgery or psychological magnetism) originated in the waning years of the eighteenth century and during the early decades of the nineteenth century, as did some of the disciplines (such as psychology and psychical research). The majority of topics too were either new or assumed hitherto unknown colours. Thus, before 1790, few if any spoke, in medical terms, of the affinity between creative genius and the hallucinations of the insane....

Striving vaguely and independently to give expression to a latent conception, various lines of thought can be brought together by some novel term. The new concept then serves as a kind of resting place

or stocktaking in the development of ideas, giving satisfaction and a stimulus for further discussion or speculation. Thus, the massive introduction of the term unconscious by Hartmann in 1869 appeared to focalize many stray thoughts, affording a temporary feeling that a crucial step had been taken forward, a comprehensive knowledge gained, a knowledge that required only further elaboration, explication, and unfolding in order to bring in a bounty of higher understanding. Ultimately, Hartmann's attempt at defining the unconscious proved fruitless because he extended its reach into every realm of organic and inorganic, spiritual, intellectual, and instinctive existence, severely diluting the precision and compromising the impact of the concept.

**Q. 1.** "The enrichments of literary and intellectual language led to an altered understanding of the meanings that underlie time-honoured expressions and traditional catchwords." Which one of the following interpretations of this sentence would be closest in meaning to the original?

1. Literary and intellectual language was altered by time-honoured expressions and traditional catchwords.
2. All of the options listed here.
3. The meanings of time-honoured expressions were changed by innovations in literary and intellectual language.
4. Time-honoured expressions and traditional catchwords were enriched by literary and intellectual language.

**Q. 2.** Which one of the following statements best describes what the passage is about?

1. The identification of the unconscious as an object of psychical research.
2. The growing vocabulary of the soul and the mind, as diverse processes.
3. The discovery of the unconscious as a part of the human mind.
4. The collating of diverse ideas under the single term: unconscious.

**Q. 3.** Which one of the following sets of words is closest to mapping the main arguments of the passage?

1. Unconscious; Latent conception; Dreams
2. Literary language; Unconscious; Insanity
3. Language; Unconscious; Psychoanalysis
4. Imagination; Magnetism; Psychiatry

**Q. 4.** All of the following statements may be considered valid inferences from the passage, EXCEPT:

1. Unrelated practices began to be treated as related to each other, as knowledge of the mind grew in the nineteenth century.
2. Eighteenth century thinkers were the first to perceive a connection between creative genius and insanity.
3. Without the linguistic developments of the nineteenth century, the growth of understanding of the soul and the mind may not have happened.
4. New conceptions in the nineteenth century could provide new knowledge because of the establishment of fields such as anaesthesiology.

## Passage 2

**Directions (Q. 5 to 8):** The passage below is accompanied by a set of questions. Choose the best answer to each question.

Back in the early 2000s, an awesome thing happened in the New X-Men comics. Our mutant heroes had been battling giant robots called Sentinels for years, but suddenly these mechanical overlords spawned a new threat: Nano-Sentinels! Not content to rule Earth with their metal fists, these tiny robots invaded our bodies at the microscopic level. Infected humans were slowly converted into machines, cell by cell.

Now, a new wave of extremely odd robots is making at least part of the Nano-Sentinels story come true. Using exotic fabrication materials like squishy hydrogels and elastic polymers, researchers are making autonomous devices that are often tiny and that could turn out to be more powerful than an Army of Terminators. Some are 1-centimetre blobs that can skate over water. Others are flat sheets that can roll themselves into tubes, or matchstick-sized plastic coils that act as powerful muscles. No, they won't be invading our bodies and turning us into Sentinels – which I personally find a little disappointing – but some of them could one day swim through our bloodstream to heal us. They could also clean up pollutants in water or fold themselves into different kinds of vehicles for us to drive.

Unlike a traditional robot, which is made of mechanical parts, these new kinds of robots are made from molecular parts. The principle is the same: both are devices that can move around and do things independently. But a robot made from smart materials might be nothing more than a pink drop of hydrogel. Instead of gears and wires, it's assembled from two kinds of molecules – some that love water and some that avoid it – which interact to allow the bot to skate on top of a pond.

Sometimes these materials are used to enhance more conventional robots. One team of researchers, for example, has developed a different kind of hydrogel that becomes sticky when exposed to a low-voltage zap of electricity and then stops being sticky when the electricity is switched off. This putty-like gel can be pasted right onto the feet or wheels of a robot. When the robot wants to climb a sheer wall or scoot across the ceiling, it can activate its sticky feet with a few volts. Once it is back on a flat surface again, the robot turns off the adhesive like a light switch.

Robots that are wholly or partly made of gloop aren't the future that I was promised in science fiction. But it's definitely the future I want. I'm especially keen on the nanometre-scale "soft robots" that could one day swim through our bodies. Metin Sitti, a director at the Max Planck Institute for Intelligent Systems in Germany, worked with colleagues to prototype these tiny, synthetic beasts using various stretchy materials, such as simple rubber, and seeding them with magnetic microparticles. They are assembled into a finished shape by applying magnetic fields. The results look like flowers or geometric shapes made from Tinkertoy ball and stick modelling kits. They're guided through tubes of fluid using magnets, and can even stop and cling to the sides of a tube.

**Q. 5.** Which one of the following statements, if true, would be the most direct extension of the arguments in the passage?

1. X-Men may be created by injecting people with mutant nano-gels that will respond to the brain's magnetic field.
2. In the future, robots will be used to search and destroy diseases even in the deepest recesses of the human body.
3. Sentinel robots will be used in warfare to cause large-scale destructive mutations amongst civilians.
4. 1-centimetre blobs of gel that have nano-robots in them will be used to send messages.

**Q. 6.** Which one of the following statements best summarises the central point of the passage?

1. Once the stuff of science fiction, nano-robots now feature in cutting-edge scientific research.
2. Robots will use nano-robots on their feet and wheels to climb walls or move on ceilings.
3. The field of robotics is likely to be feature more and more in comics like the New X-Men.
4. Nano-robots made from molecules that react to water have become increasingly useful.

**Q. 7.** Which one of the following statements best captures the sense of the first paragraph?

1. Tiny Sentinels called X-Men infected people, turning them into mutant robot overlords.
2. None of the options listed here.
3. The X-Men were mutant heroes who now had to battle tiny robots called Nano-Sentinels.
4. People who were infected by Nano-Sentinels robots became mutants who were called X-Men.

**Q. 8.** Which one of the following scenarios, if false, could be seen as supporting the passage?

1. There are two kinds of molecules used to make some nano-robots: one that reacts positively to water and the other negatively.
2. Some hydrogels turn sticky when an electric current is passed through them; this potentially has very useful applications.
3. Nano-Sentinel-like robots are likely to be used to inject people to convert them into robots, cell by cell.
4. Robots made from smart materials are likely to become part of our everyday lives in the future.

### Passage 3

**Directions (Q. 9 to 12):** The passage below is accompanied by a set of questions. Choose the best answer to each question.

Starting in 1957, [Noam Chomsky] proclaimed a new doctrine: Language, that most human of all attributes, was innate. The grammatical faculty was built into the infant brain, and your average 3-years-old was not a mere apprentice in the great enterprise of absorbing English from his or her parents, but a "linguistic genius." Since this message was couched in terms of Chomskyan theoretical linguistics, in discourse so opaque that it was nearly incomprehensible even to some scholars, many people did not hear it. Now, in a brilliant, witty and altogether satisfying book, Mr. Chomsky's colleague Steven Pinker . . . has brought Mr. Chomsky's findings to everyman. In "The Language Instinct" he has gathered persuasive data from such diverse fields as cognitive neuroscience, developmental psychology and speech therapy to make his points, and when he disagrees with Mr. Chomsky he tells you so. . . .

For Mr. Chomsky and Mr. Pinker, somewhere in the human brain there is a complex set of neural circuits that have been programmed with "super-rules" (making up what Mr. Chomsky calls "universal grammar"), and that these rules are unconscious and instinctive. A half-century ago, this would have been pooh-poohed as a "black box" theory, since one could not actually pinpoint this grammatical faculty in a specific part of the brain, or describe its functioning. But now things are different. Neurosurgeons [have now found that this] "black box" is situated in and around Broca's area, on the left side of the forebrain. . . .

Unlike Mr. Chomsky, Mr. Pinker firmly places the wiring of the brain for language within the framework of Darwinian natural selection and evolution. He effectively disposes of all claims that intelligent nonhuman primates like chimps have any abilities to learn and use language. It is not that chimps lack the vocal apparatus to speak; it is just that their brains are unable to produce or use grammar. On the other hand, the "language instinct," when it first appeared among our most distant hominid ancestors, must have given them a selective reproductive advantage over their competitors (including the ancestral chimps). . . .

So according to Mr. Pinker, the roots of language must be in the genes, but there cannot be a "grammar gene" any more than there can be a gene for the heart or any other complex body structure. This proposition will undoubtedly raise the hackles of some behavioural psychologists and anthropologists, for it apparently contradicts the liberal idea that human behaviour may be changed for the better by improvements in culture and environment, and it might seem to invite the twin bugaboos of biological determinism and racism. Yet Mr. Pinker stresses one point that should allay such fears. Even though there are 4,000 to 6,000 languages today, they are all sufficiently alike to be considered one language by an extraterrestrial observer. In other words, most of the diversity of the world's cultures, so beloved to anthropologists, is superficial and minor compared to the similarities. Racial differences are literally only "skin deep." The fundamental unity of humanity is the theme of Mr. Chomsky's universal grammar, and of this exciting book.

**Q. 9.** Which one of the following statements best summarises the author's position about Pinker's book?

1. Anatomical developments like the voice box play a key role in determining language acquisition skills.
2. Culture and environment play a key role in shaping our acquisition of language.
3. The evolutionary and deterministic framework of Pinker's book makes it racist.
4. The universality of the "language instinct" counter claims that Pinker's book is racist.

**Q. 10.** According to the passage, all of the following are true about the language instinct EXCEPT that:

1. all intelligent primates are gifted with it.
2. it confers an evolutionary reproductive advantage.
3. developments in neuroscience have increased its acceptance.
4. not all intelligent primates are gifted with it.

**Q. 11.** On the basis of the information in the passage, Pinker and Chomsky may disagree with each other on which one of the following points?

1. The inborn language acquisition skills of humans.
  2. The Darwinian explanatory paradigm for language.
  3. The language instinct.
  4. The possibility of a universal grammar.
- Q. 12.** From the passage, it can be inferred that all of the following are true about Pinker's

book, "The Language Instinct", EXCEPT that Pinker:

1. draws extensively from Chomsky's propositions.
2. disagrees with Chomsky on certain grounds.
3. writes in a different style from Chomsky.
4. draws from behavioural psychology theories.

## Passage 4

**Directions (Q. 13 to 16):** The passage below is accompanied by a set of questions. Choose the best answer to each question.

Keeping time accurately comes with a price. The maximum accuracy of a clock is directly related to how much disorder, or entropy, it creates every time it ticks. Natalia Ares at the University of Oxford and her colleagues made this discovery using a tiny clock with an accuracy that can be controlled. The clock consists of a 50-nanometre-thick membrane of silicon nitride, vibrated by an electric current. Each time the membrane moved up and down once and then returned to its original position, the researchers counted a tick, and the regularity of the spacing between the ticks represented the accuracy of the clock. The researchers found that as they increased the clock's accuracy, the heat produced in the system grew, increasing the entropy of its surroundings by jostling nearby particles . . . "If a clock is more accurate, you are paying for it somehow," says Ares. In this case, you pay for it by pouring more ordered energy into the clock, which is then converted into entropy. "By measuring time, we are increasing the entropy of the universe," says Ares. The more entropy there is in the universe, the closer it may be to its eventual demise. "Maybe we should stop measuring time," says Ares. The scale of the additional entropy is so small, though, that there is no need to worry about its effects, she says.

The increase in entropy in timekeeping may be related to the "arrow of time", says Marcus Huber at the Austrian Academy of Sciences in Vienna, who was part of the research team. It has been suggested that the reason that time only flows forward, not in reverse, is that the total amount of entropy in the universe is constantly increasing, creating disorder that cannot be put in order again.

The relationship that the researchers found is a limit on the accuracy of a clock, so it doesn't mean that a clock that creates the most possible entropy would be maximally accurate – hence a large, inefficient grandfather clock isn't more precise than an atomic clock. "It's a bit like fuel use in a car. Just because I'm using more fuel doesn't mean that I'm going faster or further," says Huber.

When the researchers compared their results with theoretical models developed for clocks that rely on quantum effects, they were surprised to find that the relationship between accuracy and entropy seemed to be the same for both..... We can't be sure yet that these results are actually universal, though, because there are many types of clocks for which the relationship between accuracy and entropy haven't been tested. "It's still unclear how this principle plays out in real devices such as atomic clocks, which push the ultimate quantum limits of accuracy," says Mark Mitchison at Trinity College Dublin in Ireland. Understanding this relationship could be helpful for designing clocks in the future, particularly those used in quantum computers and other devices where both accuracy and temperature are crucial, says Ares. This finding could also help us understand more generally how the quantum world and the classical world are similar and different in terms of thermodynamics and the passage of time.

- Q. 13.** The author makes all of the following arguments in the passage, EXCEPT that:
1. The relationship between accuracy and entropy may not apply to all clocks.
  2. Researchers found that the heat produced

in a system is the price paid for increased accuracy of measurement.

3. There is no difference in accuracy between an inefficient grandfather clock and an atomic clock.

4. In designing clocks for quantum computers, both precision and heat have to be taken into account.
- Q. 14.** Which one of the following sets of words and phrases serves best as keywords of the passage?
1. Electric current; Heat; Quantum effects
  2. Silicon Nitride; Energy; Grandfather Clock
  3. Measuring Time; Accuracy; Entropy
  4. Membrane; Arrow of time; Entropy
- Q. 15.** None of the following statements can be inferred from the passage EXCEPT that:
1. the arrow of time has not yet been tested for atomic clocks.
  2. quantum computers are likely to produce more heat and, hence, more entropy, because of the emphasis on their clocks' accuracy.
  3. grandfather clocks are likely to produce less heat and, hence, less entropy, because they are not as accurate.
  4. a clock with a 50-nanometre-thick membrane of silicon nitride has been made to vibrate, producing electric currents.
- Q. 16.** "It's a bit like fuel use in a car. Just because I'm using more fuel doesn't mean that I'm going faster or further" ... What is the purpose of this example?
1. If you go faster in a car, you will tend to consume more fuel, but the converse is not necessarily true. In the same way, increased entropy does not necessarily mean greater accuracy of a clock.
  2. The further you go in a car, the more fuel you use. In the same way, the faster you go in a car, the less time you use.
  3. If you measure the speed of a car with a grandfather clock, the result will be different than if you measured it with an atomic clock.
  4. The further and faster you go in a car, the greater the amount of fuel you will use, the greater the amount of heat produced and, hence, the greater the entropy.
- Q. 17.** The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.
- People view idleness as a sin and industriousness as a virtue, and in the process have developed an unsatisfactory relationship with their jobs. Work has become a way for them to keep busy, even though many find their work meaningless. In their need for activity people undertake what was once considered work (fishing, gardening) as hobbies. The opposing view is that hard work has made us prosperous and improved our levels of health and education. It has also brought innovation and labour and time-saving devices, which have lessened life's drudgery.
1. Hard work has overtaken all aspects of our lives and has enabled economic prosperity, but it is important that people reserve their leisure time for some idleness.
  2. Some believe that hard work has been glorified to the extent that it has become meaningless, and led to greater idleness, but it has also had enormous positive impacts on everyday life.
  3. While the idealisation of hard work has propelled people into meaningless jobs and endless activity, it has also led to tremendous social benefits from prosperity and innovation.
  4. Despite some detractors, hard work is essential in today's world to enable economic progress, for education and health and to propel innovations that make life easier.
- Q. 18.** The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.
- Brazil's growth rate has been low, yet most Brazilians say their financial situation has improved, and they expect it to get even better. This is because most incomes are rising fast, with higher minimum wages and very low unemployment. The result is falling inequality and a growing middle class — the result of economic stabilization, improved social security and universal primary education. But despite recent improvements

the Brazilian economy is still painfully unequal, with poor Brazilians paying the biggest share of their income in taxes and getting the least back in government services.

1. With rising incomes and falling unemployment, most Brazilians are being misled into thinking that their economy is doing well.
2. Most Brazilians feel they have benefitted from recent economic events, but the poor continue to be dealt unfairly by the state.
3. Economic reforms have benefitted many Brazilians, but they are unaware of the impending problems from rising inequalities in their society.
4. Good economic indicators have masked the unfair taxation of the poor that is likely to destabilise the Brazilian economy in the next few years.

**Q. 19. The four sentences (labelled 1, 2, 3, 4) below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer:**

1. It is regimes of truth that make certain relationships speakable – relationships, like subjectivities, are constituted through discursive formations, which sustain regimes of truth.
2. Relationships are nothing without the communication that brings them into being; interpersonal communication is connected to knowledge shared by interlocutors, and scholars should attend to relational histories in their analyses.
3. A Foucauldian approach to relationships goes beyond these conceptions of discourse and history to macro level regimes of truth as constituting relationships.
4. Reconsidering micropractices within relationships that are constituted within and simultaneously contributors to regimes of truth acknowledges the central position of power/knowledge in the constitution of what has come to be considered true and real.

**Q. 20. Five jumbled up sentences, related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd one out and key in the number of the sentence as your answer:**

1. They often include a foundation course on navigating capitalism with Chinese characteristics and have replaced typical cases from US corporates with a focus on how Western theories apply to China's buzzing local firms.
2. The best Chinese business schools look like their Western rivals but are now growing distinct in terms of what they teach and the career boost they offer.
3. Western schools have enhanced their offerings with double degrees, popular with domestic and overseas students alike—and boosted the prestige of their Chinese partners.
4. For students, a big draw is the chance to rub shoulders with captains of China's private sector.
5. Their business courses now largely cater to the growing demand from China Inc which has become more global, richer and ready to recruit from this sinocentric student body.

**Q. 21. The four sentences (labelled 1, 2, 3 and 4) below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer:**

1. Restitution of artefacts to original cultures could face legal obstacles, as many Western museums are legally prohibited from disposing off their collections.
2. This is in response to countries like Nigeria, which are pressurising European museums to return their precious artefacts looted by colonisers in the past.
3. Museums in Europe today are struggling to come to terms with their colonial legacy, some taking steps to return artefacts but not wanting to lose their prized collections.
4. Legal hurdles notwithstanding, politicians and institutions in France and Germany

would now like to defuse the colonial time bombs, and are now backing the return of part of their holdings.

**Q. 22. Five jumbled up sentences, related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd one out and key in the number of the sentence as your answer:**

1. A typical example is Wikipedia, where the overwhelming majority of contributors are male and so the available content is skewed to reflect their interests.
2. Without diversity of thought and representation, society is left with a distorted picture of future options, which are likely to result in augmenting existing inequalities.
3. Gross gender inequality in the technology sector is problematic, not only for the industry-wide marginalisation of women, but because technology designs embody the values of their makers.
4. While redressing unequal representation in the workplace is a step in the right direction, broader social change is needed to address the structural inequalities embedded within the current organisation of work and employment.
5. If technology merely reflects the perspectives of the male stereotype, then new technologies are unlikely to accommodate the diverse social contexts within which they operate.

**Q. 23. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.**

The human mind is wired to see patterns. Not only does the brain process information as it comes in, it also stores insights from all our past experiences. Every interaction, happy or sad, is catalogued in our memory. Intuition draws from that deep memory well to inform our decisions going forward. In other words, intuitive decisions are based on data, and not contrary to data as many would like to assume. When we subconsciously spot

patterns, the body starts firing neurochemicals in both the brain and gut. These "somatic markers" are what give us that instant sense that something is right ... or that it's off. Not only are these automatic processes faster than rational thought, but our intuition draws from decades of diverse qualitative experience (sights, sounds, interactions, etc.) – a wholly human feature that big data alone could never accomplish.

1. Intuitions are neurochemical firings based on pattern recognition and draw upon a rich and vast database of experiences.
2. Intuition is infinitely richer than big data which is based on rational thought and accomplishes more than what big data can.
3. Intuitions are automatic processes and are therefore faster than rational thought, and so decisions based on them are better.
4. Intuition draws from deep memory, and may not be related to data, but to decades of diverse qualitative experience.

**Q. 24. The four sentences (labelled 1, 2, 3 and 4) below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer:**

1. Businesses find automation, such as robotic employees, a big asset in terms of productivity and efficiency.
2. But in recent years, robotics has had increasing impacts on unemployment, not just of manual labour, as computers are rapidly handling some white-collar and service-sector work.
3. For years politicians have promised workers that they would bring back their jobs by clamping down on trade, offshoring and immigration.
4. Economists, based on their research, say that the bigger threat to jobs now is not globalisation but automation.

## Data Interpretation and Logical Reasoning (DILR)

**Directions (Q. 1 to 6):** Read the following passage and table carefully and answer the questions that follows:

10 players – P1, P2, … , P10 – competed in an international javelin throw event. The number (after P) of a player reflects his rank at the beginning of the event, with rank 1 going to the topmost player. There were two phases in the event with the first phase consisting of rounds 1, 2 and 3, and the second phase consisting of rounds 4, 5 and 6. A throw is measured in terms of the distance it covers (in meters, up to one decimal point accuracy), only if the throw is a ‘valid’ one. For an invalid throw, the distance is taken as zero. A player’s score at the end of a round is the maximum distance of all his throws up to that round. Players are re-ranked after every round based on their current scores. In case of a tie in scores, the player with a prevailing higher rank retains the higher rank. This ranking determines the order in which the players go for their throws in the next round.

In each of the rounds in the first phase, the players throw in increasing order of their latest rank, i.e., the player ranked 1 at that point throws first, followed by the player ranked 2 at that point and so on. The top six players at the end of the first phase qualify for the second phase. In each of the rounds in the second phase, the players throw in decreasing order of their latest rank i.e., the player ranked 6 at that point throws first, followed by the player ranked 5 at that point and so on. The players ranked 1, 2 and 3 at the end of the sixth round receive gold, silver and bronze medals respectively.

All the valid throws of the event were of distinct distances (as per stated measurement accuracy). The tables below show distances (in meters) covered by all valid throws in the first and the third round in the event.

**Distances covered by all the valid throws in the first round**

Player	Distance (in m)
P1	82.9
P3	81.5
P5	86.4
P6	82.5
P7	87.2
P9	84.1

**Distances covered by all the valid throws in the third round**

Player	Distance (in m)
P1	88.6
P3	79.0
P9	81.4

The following facts are also known.

- (i) Among the throws in the second round, only the last two were valid. Both the throws enabled these players to qualify for the second phase, with one of them qualifying with the least score. None of these players won any medal.
- (ii) If a player throws first in a round and he was also the last (among the players in the current round) to throw in the previous round, then the player is said to get a double. Two players got a double.
- (iii) In each round of the second phase, exactly one player improved his score. Each of these improvements was by the same amount.
- (iv) The gold and bronze medalists improved their scores in the fifth and the sixth rounds respectively. One medal winner improved his score in the fourth round.
- (v) The difference between the final scores of the gold medalist and the silver medalist, as well as the difference between the final scores of the silver medalist and the bronze medalist was 1.0 m.

**Q. 1.** Which two players got the double?

- |            |           |
|------------|-----------|
| 1. P8, P10 | 2. P2, P4 |
| 3. P1, P10 | 4. P1, P8 |

**Q. 2.** Who won the silver medal?

- |       |       |
|-------|-------|
| 1. P7 | 2. P9 |
| 3. P1 | 4. P5 |

**Q. 3.** Who threw the last javelin in the event?

- |        |       |
|--------|-------|
| 1. P10 | 2. P9 |
| 3. P1  | 4. P7 |

**Q. 4.** What was the final score (in m) of the silver-medalist?

- |         |         |
|---------|---------|
| 1. 87.2 | 2. 88.6 |
| 3. 89.6 | 4. 88.4 |

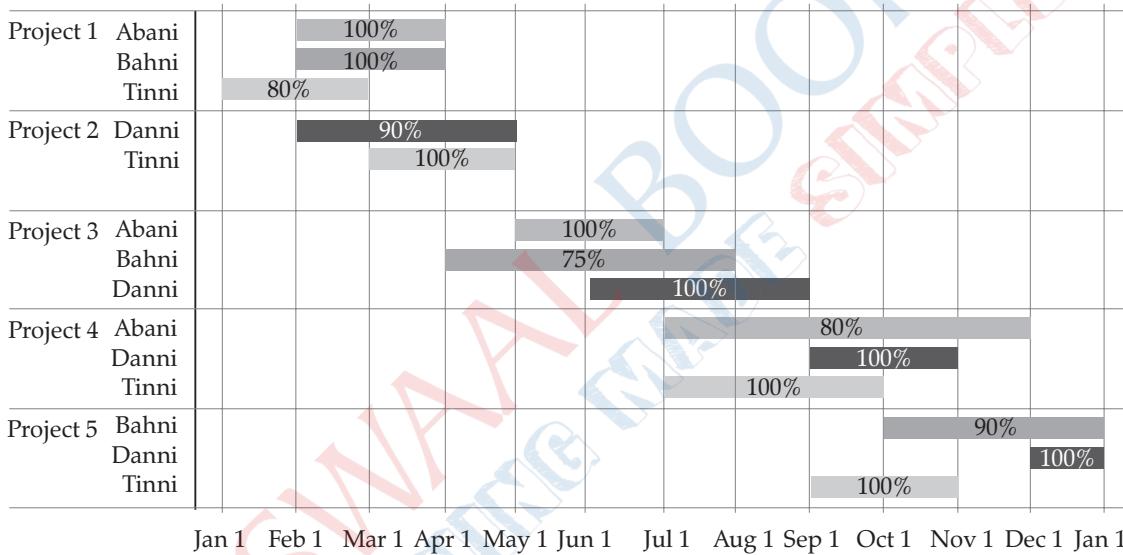
**Q. 5.** Which of the following can be the final score (in m) of P8?

- |         |         |
|---------|---------|
| 1. 0    | 2. 81.9 |
| 3. 85.1 | 4. 82.7 |

**Q. 6.** By how much did the gold medalist improve his score (in m) in the second phase?

- |        |        |
|--------|--------|
| 1. 2.4 | 2. 2.0 |
| 3. 1.0 | 4. 1.2 |

**Directions (Q. 7 to 10):** Read the following passage and bar graph carefully and answer the questions that follows:



The figure above shows the schedule of four employees – Abani, Bahni, Danni and Tinni – whom Dhoni supervised in 2020. Altogether there were five projects which started and concluded in 2020 in which they were involved. For each of these projects and for each employee, the starting day was at the beginning of a month and the concluding day was the end of a month, and these are indicated by the left and right end points of the corresponding horizontal bars. The number within each bar indicates the percentage of assigned work completed by the employee for that project, as assessed by Dhoni.

For each employee, his/her total project-month (in 2020) is the sum of the number of months (s) he worked across the five project, while his/her annual completion index is the weightage average of the completion percentage assigned from the different projects, with the weights being the corresponding number of months (s) he worked in these projects. For each project, the total employee-month is the sum of the number of months four employees worked in this project, while its completion index is the weightage average of the completion percentage assigned for the employees who worked in this project, with the weights being the corresponding number of months they worked in this project.

**Q. 7.** Which of the following statements is/are true?

- I: The total project-month was the same for the four employees.
  - II: The total employee-month was the same for the five projects.
- |                  |                     |
|------------------|---------------------|
| 1. Only II       | 2. Neither I nor II |
| 3. Both I and II | 4. Only I           |

**Q. 8.** Which employees did not work in multiple projects for any of the months in 2020?

- |                                |
|--------------------------------|
| 1. All four of them            |
| 2. Only Tinni                  |
| 3. Only Abani and Bahni        |
| 4. Only Abani, Bahni and Danni |

**Q. 9.** The project duration, measured in terms of the number of months, is the time during which at least one employee worked in the project. Which of the following pairs of the projects had the same duration?

1. Project 3, Project 5
2. Project 1, Project 5
3. Project 4, Project 5
4. Project 3, Project 4

**Q. 10.** The list of employees in decreasing order of annual completion index is:

1. Danni, Tinni, Abani, Bahni
2. Tinni, Danni, Abani, Bahni
3. Bahni, Abani, Tinni, Danni
4. Danni, Tinni, Bahni, Abani

**Directions (Q. 11 to 16):** Read the following passage carefully and answer the questions that follows:

Three reviewers Amal, Bimal and Komal are tasked with selecting questions from a pool of 13 questions (Q01 to Q13). Questions can be created by external “subject matter experts” (SMEs) or by one of the three reviewers. Each of the reviewers either approves or disapproves a question that is shown to them. Their decisions lead to eventual acceptance or rejection of the question in the manner described below.

If a question is created by an SME, it is reviewed first by Amal, and then by Bimal. If both of them approve the question, then the question is accepted and is not reviewed by Komal. If both disapprove the question, it is rejected and is not reviewed by Komal. If one of them approves the question and the other disapproves it, then the question is reviewed by Komal. Then the question is accepted only if she approves it.

A question created by one of the reviewers is decided upon by the other two. If a question is created by Amal, then it is first reviewed by Bimal. If Bimal approves the question, then it is accepted. Otherwise, it is reviewed by Komal. The question is then accepted only if Komal approves it. A similar process is followed for questions created by Bimal, whose questions are first reviewed by Komal, and then by Amal only if Komal disapproves it. Questions created by Komal are first reviewed by Amal, and then, if required, by Bimal.

The following facts are known about the review process after its completion.

1. Q02, Q06, Q09, Q11, and Q12 were rejected and the other questions were accepted.
2. Amal reviewed only Q02, Q03, Q04, Q06, Q08, Q10, Q11 and Q13.
3. Bimal reviewed only Q02, Q04, Q06 through Q09, Q12 and Q13.
4. Komal reviewed only Q01 through Q05, Q07, Q08, Q09, Q11 and Q12.

**Q. 11.** How many questions were DEFINITELY created by Amal?

to the number of questions (s)he reviewed. Which option best describes Amal’s approval ratio?

1. lies between 0.25 and 0.50
2. either 0.25 or 0.75
3. 0.25
4. lies between 0.25 and 0.75

**Q. 12.** How many questions were DEFINITELY created by Komal?

**Q. 16.** How many questions created by Amal or Bimal were disapproved by at least one of the other reviewers?

1. 2
2. 5
3. 7
4. 4

**Q. 13.** How many questions were DEFINITELY created by the SMEs?

- |      |      |
|------|------|
| 1. 3 | 2. 4 |
| 3. 5 | 4. 7 |

**Q. 14.** How many questions were DEFINITELY disapproved by Bimal?

**Q. 15.** The approval ratio of a reviewer is the ratio of the number of questions (s)he approved

**Directions (Q. 17 to 20):** Read the following passage carefully and answer the questions that follows:

Each of the bottles mentioned in this question contains 50 mL of liquid. The liquid in any bottle can be 100% pure content (P) or can have certain amount of impurity (I). Visually it is not possible to distinguish between P and I. There is a testing device which detects impurity, as long as the percentage of impurity in the content tested is 10% or more.

For example, suppose bottle 1 contains only P and bottle 2 contains 80% P and 20% I. If content from bottle 1 is tested, it will be found out that it contains only P. If content of bottle 2 is tested, the test will reveal that it contains some amount of I. If 10 ml of content from bottle 1 is mixed with 20 ml content from bottle 2, the test will show that the mixture has impurity, and hence we can conclude that at least one of the two bottles has I. However, if 10 ml of content from bottle 1 is mixed with 5 ml of content from bottle 2, the test will not detect any impurity in the resultant mixture.

**Q. 17.** 5 ml of content from bottle A is mixed with 5 ml of content from bottle B. The resultant mixture, when tested, detects the presence of I. If it is known that bottle A contains only P, what BEST can be concluded about the volume of I in bottle B?

1. Less than 1 ml
2. 10 ml
3. 10 ml or more
4. 1 ml

**Q. 18.** There are four bottles. Each bottle is known to contain only P or only I. They will be considered to be "collectively ready for despatch" if all of them contain only P. In minimum how many tests, is it possible to ascertain whether these four bottles are "collectively ready for despatch"?

**Q. 19.** There are four bottles. It is known that three of these bottles contain only P, while the remaining one contains 80% P and 20% I. What is the minimum number of tests required to definitely identify the bottle containing some amount of I?

**Q. 20.** There are four bottles. It is known that either one or two of these bottles contain(s) only P, while the remaining ones contain 85% P and 15% I. What is the minimum number of tests required to ascertain the exact number of bottles containing only P?

1. 2
2. 4
3. 3
4. 1

## Quantitative Aptitude (QA)

**Q. 1.** A four-digit number is formed by using only the digits 1, 2 and 3 such that both 2 and 3 appear at least once. The number of all such four-digit numbers is

**Q. 2.** Let ABCD be a parallelogram. The lengths of the side AD and the diagonal AC are 10 cm and 20 cm, respectively. If the angle  $\angle ADC$  is equal to  $30^\circ$ , then the area of the parallelogram, in sq. cm, is

1.  $25(\sqrt{3} + \sqrt{15})$
2.  $\frac{25(\sqrt{5} + \sqrt{15})}{2}$
3.  $\frac{25(\sqrt{3} + \sqrt{15})}{2}$
4.  $25(\sqrt{5} + \sqrt{15})$

**Q. 3.** Bank A offers 6% interest rate per annum compounded half yearly. Bank B and Bank C offer simple interest but the annual interest rate offered by Bank C is twice that of Bank B. Raju invests a certain amount in Bank B for a certain period and Rupa invests ₹10,000 in Bank C for twice that period. The interest that would accrue to Raju during that period is equal to the interest that would have accrued had he invested the same amount in Bank A for one year. The interest accrued, in ₹, to Rupa is

1. 1436
2. 2346
3. 2436
4. 3436

**Q. 4.** The cost of fencing a rectangular plot is ₹200 per ft along one side, and ₹100 per ft along the three other sides. If the area of the rectangular plot is 60000 sq. ft, then the lowest possible cost of fencing all four sides, in ₹, is

1. 120000
2. 100000
3. 160000
4. 90000

**Q. 5.** For a real number  $a$ , if  $\frac{\log_{15} a + \log_{32} a}{(\log_{15} a)(\log_{32} a)} = 4$ , then  $a$  must lie in the range.

1.  $a > 5$
2.  $3 < a < 4$
3.  $2 < a < 3$
4.  $4 < a < 5$

**Q. 6.** If  $n$  is a positive integer such that  $(\sqrt[3]{10})(\sqrt[3]{10})^2 \dots (\sqrt[3]{10})^n > 999$ , then the smallest value of  $n$  is

**Q. 7.** In a triangle ABC,  $\angle BCA = 50^\circ$ . D and E are points on AB and AC, respectively, such that  $AD = DE$ . If F is a point on BC such that  $BD = DF$ , then  $\angle FDE$ , in degrees, is equal to

1. 96                    2. 100  
  3. 80                    4. 72
- Q. 8.** Anil can paint a house in 12 days while Barun can paint it in 16 days. Anil, Barun and Chandu undertake to paint the house for ₹24000 and the three of them together complete the painting in 6 days. If Chandu is paid in proportion to the work done by him, then the amount in ₹ received by him is
- Q. 9.** The arithmetic mean of scores of 25 students in an examination is 50. Five of these students top the examination with the same score. If the scores of the other students are distinct integers with the lowest being 30, then the maximum possible score of the toppers is
- Q. 10.** If  $f(x) = x^2 - 7x$  and  $g(x) = x + 3$ , then the minimum value of  $f(g(x)) - 3x$  is
- |        |        |
|--------|--------|
| 1. -15 | 2. -20 |
| 3. -16 | 4. -12 |
- Q. 11.** Mira and Amal walk along a circular track, starting from the same point at the same time. If they walk in the same direction, then in 45 minutes, Amal completes exactly 3 more rounds than Mira. If they walk in opposite directions, then they meet for the first time exactly after 3 minutes. The number of rounds Mira walks in one hour is
- Q. 12.** A park is shaped like a rhombus and has area 96 sq m. If 40 m of fencing is needed to enclose the park, the cost, in ₹, of laying electric wires along its two diagonals, at the rate of ₹125 per m, is
- Q. 13.** In a tournament, a team has played 40 matches so far and won 30% of them. If they win 60% of the remaining matches, their overall win percentage will be 50%. Suppose they win 90% of the remaining matches, then the total number of matches won by the team in the tournament will be
- |       |       |
|-------|-------|
| 1. 86 | 2. 84 |
| 3. 80 | 4. 78 |
- Q. 14.** The total of male and female populations in a city increased by 25% from 1970 to 1980. During the same period, the male population increased by 40% while the female population increased by 20%. From 1980 to 1990, the female population increased by 25%. In 1990, if the female population is twice the male population, then the percentage increase in the total of male and female populations in the city from 1970 to 1990 is
- |          |          |
|----------|----------|
| 1. 68.75 | 2. 68.25 |
| 3. 69.25 | 4. 68.50 |
- Q. 15.** Consider a sequence of real numbers  $x_1, x_2, x_3, \dots$  such that  $x_{n+1} = x_n + n - 1$  for all  $n \geq 1$ . If  $x_1 = -1$ , then  $x_{100}$  is equal to
- |         |         |
|---------|---------|
| 1. 4949 | 2. 4850 |
| 3. 4849 | 4. 4950 |
- Q. 16.** If a certain weight of an alloy of silver and copper is mixed with 3 kg of pure silver, the resulting alloy will have 90% silver by weight. If the same weight of the initial alloy is mixed with 2 kg of another alloy which has 90% silver by weight, the resulting alloy will have 84% silver by weight. Then, the weight of the initial alloy, in kg, is
- |        |        |
|--------|--------|
| 1. 3   | 2. 2.5 |
| 3. 3.5 | 4. 4   |
- Q. 17.** A shop owner bought a total of 64 shirts from a wholesale market that came in two sizes, small and large. The price of a small shirt was ₹50 less than that of a large shirt. She paid a total of ₹5000 for the large shirts, and a total of ₹1800 for the small shirts. Then, the price of a large shirt and a small shirt together, in ₹, is
- |        |        |
|--------|--------|
| 1. 150 | 2. 225 |
| 3. 175 | 4. 200 |
- Q. 18.** One day, Rahul started a work at 9 AM and Gautam joined him two hours later. They then worked together and completed the work at 5 PM the same day. If both had started at 9 AM and worked together, the work would have been completed 30 minutes earlier. Working alone, the time Rahul would have taken, in hours, to complete the work is
- |         |         |
|---------|---------|
| 1. 10   | 2. 12   |
| 3. 11.5 | 4. 12.5 |
- Q. 19.** One part of a hostel's monthly expenses is fixed, and the other part is proportional to the number of its boarders. The hostel collects ₹1600 per month from each boarder. When the number of boarders is 50, the profit of the hostel is ₹200 per boarder, and when the number of boarders is 75, the profit of the hostel is ₹250 per boarder. When the number of boarders is 80, the total profit of the hostel, in ₹, will be

1. 20200      2. 20500  
3. 20000      4. 20800

**Q. 20.** If  $3x + 2|y| + y = 7$  and  $x + |x| + 3y = 1$ , then  $x + 2y$  is

1.  $-\frac{4}{3}$       2. 1  
3. 0      4.  $\frac{8}{3}$

**Q. 21.** A tea shop offers tea in cups of three different sizes. The product of the prices, in ₹, of three

different sizes is equal to 800. The prices of the smallest size and the medium size are in the ratio 2 : 5. If the shop owner decides to increase the prices of the smallest and the medium ones by ₹6 keeping the price of the largest size unchanged, the product then changes to 3200. The sum of the original prices of three different sizes, in ₹, is

**Q. 22.** The number of distinct pairs of integers  $(m, n)$  satisfying  $|1 + mn| < |m + n| < 5$  is

**Answer Key****Verbal Ability and Reading Comprehension (VARC)**

1. (3)	2. (4)	3. (3)	4. (4)	5. (2)	6. (1)	7. (3)	8. (3)	9. (4)	10. (1)
11. (2)	12. (4)	13. (2)	14. (3)	15. (2)	16. (1)	17. (3)	18. (2)	19. 2314	20. (3)
21. 3214	22. (4)	23. (1)	24. 3412						

**Data Interpretation and Logical Reasoning (DILR)**

1. (1)	2. (3)	3. (4)	4. (2)	5. (4)	6. (1)	7. (4)	8. (4)	9. (4)	10. (1)
11. 3	12. 1	13. 3	14. (2)	15. (4)	16. (2)	17. (3)	18. 1	19. 2	20. (4)

**Quantitative Aptitude (QA)**

1. 50	2. (1)	3. (3)	4. (1)	5. (4)	6. (6)	7. (3)	8. 3000	9. 92	10. (3)
11. (8)	12. 3500	13. (2)	14. (1)	15. (2)	16. (1)	17. (4)	18. (1)	19. (2)	20. (3)
21. 34	22. 12								

## Answers and Explanations

## Verbal Ability and Reading Comprehension (VARC)

**1. Option (3) is correct.**

It can be deduced from the second paragraph that the nineteenth century witnessed an increase in the vocabulary concerning the soul and the mind. Therefore, seemingly unrelated issues, practices started to be related to each other, and it also observed a transformed understanding of the meanings that underlie time-honored expressions and traditional catchwords. This confirms that the meanings of time-honored expressions were changed by innovations in literary and intellectual language. (4) is a red-herring to state that time-honored expressions and traditional catchwords were enriched by literary and intellectual language. (1) is contradicting the essence of (3).

**2. Option (4) is correct.**

The passage starts with the evolution of the unconscious, which gained prominence and started getting defined in specialized terms within the realm of medical psychology. It was followed by the enrichment in the vocabulary of the unconscious, 'once coined, powerful new ideas attracted to themselves a whole host of seemingly unrelated issues, practices, and experiences, creating a peculiar network of preoccupations that as a group had not existed before.' Since majority of practices (for example, hypnotism in surgery or psychological magnetism) or some of the disciplines (such as psychology and psychical research) were either new, Hartmann developed the concept of the unconscious 'to focalize many stray thoughts... and unfolding in order to bring in a bounty of higher understanding.' This is indicative of the approach of the unconscious-to collate diverse thoughts . (2) is too broad and not specific to the intent behind the evolution

of the unconscious; (1) cannot be justified as the central idea of the passage; (3) does not make sense as the central idea.

**3. Option (3) is correct.**

The passage deals primarily with the unconscious and the transformation in languages that occur to be merged under the head of the unconscious. Therefore, (4) can be definitely eliminated as it hardly deals with both the pointers. So can (1) be rejected for excluding language. (3) and (2) can be zeroed in on as the correct ones, but (2) includes literary language, which makes the arguments of the passage too narrow. The passage is about the linguistic developments that was collated to form the unconscious. The unconscious burst the framework of conventional language, not literary language. Since the term 'unconscious' came to be defined in specialized terms within the realm of medical psychology and freudian psychoanalysis, 'psychoanalysis' suits the best in validating the argument of the passage.

**4. Option (4) is correct.**

It is inferred from the second paragraph that 'the vocabulary concerning the soul and the mind increased enormously in the course of the nineteenth century.... At the same time, once coined, powerful new ideas attracted to themselves a whole host of seemingly unrelated issues, practices, and experiences, creating a peculiar network of preoccupations that as a group had not existed before.' Thus, it is true that unrelated practices began to be treated as related to each other, as knowledge of the mind grew in the nineteenth century. The statement that the affinity between creative genius and the hallucinations of the insane was hardly spoken of before 1790 confirms that eighteenth century thinkers were the first to perceive a connection

between creative genius and insanity. Thus, (2) is true. It was the enormous and enriching vocabulary concerning the soul and the mind in the course of the nineteenth century, that the intellectual language 'led to an altered understanding of the meanings that underlie time-honoured expressions and traditional catchwords.' Hence, it is true that without the linguistic developments of the nineteenth century, the growth of understanding of the soul and the mind may not have happened. Whereas, nothing is implied in the passage to infer about the establishment of fields such as anaesthesiology.

Therefore, the statement in (4) that new conceptions in the nineteenth century could provide new knowledge because of the establishment of fields such as anesthesiology cannot be inferred.

**5. Option (2) is correct.**

It is stated that with the help of materials like squishy hydrogels and elastic polymers, researchers are making autonomous devices that are often tiny yet powerful and 'some of them could one day swim through our bloodstream to heal us. They could also clean up pollutants in water or fold themselves into different kinds of vehicles for us to drive.' This affirms that in the future, robots will be used to search and destroy diseases even in the deepest recesses of the human body. (3) is incorrect and extreme because the new wave of extremely odd robots will not turn us into Sentinels or be used in warfare to cause large-scale destructive mutations amongst civilians. (1) is an exaggerated judgment. The attribute of 1-centimetre blobs of gel that have nano-robots in them being used to send messages is nowhere discussed.

Therefore, the statement in the future, robots will be used to search and destroy diseases even in the deepest recesses of the human body is the most direct extension of the arguments in the passage.

**6. Option (1) is correct.**

The passage starts with the sudden dawn of 'Nano-Sentinels' straight from the New X-Men comics (science fiction). It comes with the announcement that 'a new wave of

extremely odd robots is making at least part of the Nano-Sentinels story come true', for which researchers are developing different materials that will suit the purpose of these robots. The entire passage is from the perspective of a research work, the subject being the nano-robots. (2) cannot be justified as the central idea of the passage, it is just a fragment of the bigger issue. There is not adequate data in the passage to suggest that the field of robotics is likely to be feature more and more in comics like the New X-Men. Thus, (3) is eliminated. (4) is not elaborated, hence negated from consideration.

Therefore, the statement 'Once the stuff of science fiction, nano-robots now feature in cutting-edge scientific research' best summarises the central point of the passage.

**7. Option (3) is correct.**

The first paragraph posits the mutant heroes of New X-Men comics, who earlier had been battling giant robots called Sentinels, has met their new threat in the form of Nano-Sentinels. This is best illustrated in (3). (4) is incorrect to claim that people were infected by Nano-Sentinel robots became mutants. (1) is incorrect because it were not the Sentinels called X-Men, that infected people, turning them into mutant robot overlords.

Therefore, the statement : the X-Men were mutant heroes who now had to battle tiny robots called Nano-Sentinels best captures the sense of the first paragraph.

**8. Option (3) is correct.**

(3) is an extension of the scenario of the new X-Men comics, when Nano-Sentinel-like robots infected humans, who were slowly converted into machines, cell by cell. In fact, some of them 'could one day swim through our bloodstream to heal us. They could also clean up pollutants in water or fold themselves into different kinds of vehicles for us to drive.' Thus, if the given statement is false, it would lend credence to the objective of the Nano-Sentinel-like robots. The writer definitely is sanguine with (1), when he says, 'it's assembled from two kinds of molecules – some that love water and some that avoid it – which interact to allow the bot to skate on top of a pond.' (4) is negated because,

according to the writer, 'But a robot made from smart materials might be nothing more than a pink drop of hydrogel.' This 'new wave of extremely odd robots is making at least part of the Nano-Sentinels story come true' as it makes use of exotic fabrication materials like squishy hydrogels and elastic polymers, researchers are making autonomous devices that are often tiny and that could turn out to be more powerful than an Army of Terminators. (2) is elaborated in the fourth paragraph, when the writer refers to 'a different kind of hydrogel that becomes sticky when exposed to a low-voltage zap of electricity' and this can be pasted right onto the feet or wheels of a robot to activate its sticky feet with a few volts.

**9. Option (4) is correct.**

(4) definitely summarises the author's position about Pinker's book, as indicated in the final paragraph. Pinker establishes that the diversity of languages is still considered to be one, by the extra-terrestrial observer. To summarise, the similarities of varied cultures is universal, and the concept of racism is only superficial and skin-deep. Therefore, the universality of the "language instinct" counter claims that Pinker's book is racist. (1) is ridiculous and cannot be supported from the passage, hence it is not worth being considered as a summary to Pinker's book. (3) challenges the kernel of Pinker's book – the roots of language must be in the genes. The book defines 'the bugaboos of biological determinism and racism', and establishes that racism is only skin-deep. (2) is inappropriate to conclude that culture and environment play a key role in shaping our acquisition of language, because Pinker's book very much contradicts 'the liberal idea that human behaviour may be changed for the better by improvements in culture and environment.'

Therefore, the universality of the "language instinct" counter claims that Pinker's book is racist, forms the best summary of the author's position about Pinker's book.

**10. Option (1) is correct.**

It is incorrect to say that all intelligent primates are gifted with it because Mr. Pinker, by wiring the language instinct within the framework of Darwinian natural selection and evolution,

manifests that intelligent nonhuman primates like chimps may not have any abilities to learn and use language. The ones like the 'distant hominid ancestors, must have given them a selective reproductive advantage over' the chimps. This also negates the truth in (4), while demonstrating the appropriateness of the statement that language instinct confers an evolutionary reproductive advantage (2). (3) can be corroborated from the statement: 'In "The Language Instinct" Steven Pinker has gathered persuasive data from such diverse fields as cognitive neuroscience, developmental psychology and speech therapy to make his points.'

Therefore, it is not correct that all intelligent primates are gifted with language instinct.

**11. Option (2) is correct.**

It is explicitly stated that 'unlike Mr. Chomsky, Mr. Pinker firmly places the wiring of the brain for language within the framework of Darwinian natural selection and evolution.' Pinker based the language instinct within the framework of Darwinian natural selection and evolution, while Mr. Chomsky considered it to be innate. (4) cannot be ascertained from Mr. Chomsky's theories; (3) is the common point of discussion. (1) was not denied by Pinker, he elaborated on it, but based his ideas on the framework of Darwinian natural selection and evolution.

Therefore, the Darwinian explanatory paradigm for language is the point of disagreement between Mr. Chomsky and Mr. Pinker.

**12. Option (4) is correct.**

It is evident from the first paragraph that Steven Pinker 'has brought Mr. Chomsky's findings to everyman', by gathering 'persuasive data from such diverse fields as cognitive neuroscience, developmental psychology and speech therapy to make his points, and when he disagrees with Mr. Chomsky he tells you so'. This evinces that Pinker was drawing extensively from Chomsky's proposition and wrote in a different style from Chomsky. He also disagreed with Chomsky on certain grounds- 'Unlike Mr. Chomsky, Mr. Pinker firmly places the wiring of the brain for language within the framework

of Darwinian natural selection and evolution.' (4) cannot be determined from the passage, as he 'gathered persuasive data from such diverse fields as cognitive neuroscience, developmental psychology and speech therapy'.

Therefore, the argument that Pinker draws from behavioural psychology theories is inappropriate.

**13. Option (2) is correct.**

(1) is inferred when the researchers compared their results with theoretical models developed for clocks that rely on quantum effects, 'they were surprised to find that the relationship between accuracy and entropy seemed to be the same for both.' Hence a large, inefficient grandfather clock isn't more precise than an atomic clock. Thus, it is clear that the relationship between accuracy and entropy may not apply to all clocks. (2) is incorrect because the researchers found that "If a clock is more accurate, you are paying for it somehow," says Ares. In this case, you pay for it by pouring more ordered energy into the clock, which is then converted into entropy. "But Ares concludes that the scale of the additional entropy is so small, though, that there is no need to worry about its effects. (3) is implied in the passage's findings, when a group of researchers found that 'a clock that creates the most possible entropy would be maximally accurate – hence a large, inefficient grandfather clock isn't more precise than an atomic clock.' Hence, it is true that there is no difference in accuracy between an inefficient grandfather clock and an atomic clock. (4) is correctly inferred when Ares declares, that the 'relationship could be helpful for designing clocks in the future, particularly those used in quantum computers and other devices where both accuracy and temperature are crucial'. Hence, it is true that in designing clocks for quantum computers, both precision and heat have to be taken into account.

**14. Option (3) is correct.**

The passage is all about measuring time and largely focuses on the relationship between accuracy and entropy. The passage has some loose references to electric current and grandfather clock, but the main key ideas of

accuracy and entropy are amiss. Thus, both (1) and (2) are eliminated. (4) is a good option, considering the inclusion of entropy and arrow of time (which gains focus at a certain point), but 'membrane' does not make the option a strong one, given the emphasis of the passage on measuring of time and accuracy.

Therefore, Measuring Time; Accuracy; Entropy is the correct set of words and phrases that serves best as keywords of the passage.

**15. Option (2) is correct.**

(1) cannot be implied because, as per the researchers, 'there are many types of clocks for which the relationship between accuracy and entropy haven't been tested. "It's still unclear how this principle plays out in real devices such as atomic clocks'. This evinces that arrow of time must have been tested on atomic clocks. That's why one does not understand how arrow of time plays out in atomic clocks. (2) is implicit in the passage, especially in the last paragraph the relationship between accuracy and entropy is crucial for quantum computers and other devices where both accuracy and temperature are crucial. Thus, it is safe to say that quantum computers are likely to produce more heat and, hence, more entropy, because of the emphasis on their clocks' accuracy. The assertion in (3) that 'grandfather clocks are likely to produce less heat and, hence, less entropy, because they are not as accurate' is contradicting the argument of the passage. (4) is clearly not implicit because, a clock with '50-nanometre-thick membrane of silicon nitride, was vibrated by an electric current', it did not produce electric currents.

**16. Option (1) is correct.**

It is evident from the context that the reference to the fuel used in a car is used to justify that 'it doesn't mean that a clock that creates the most possible entropy would be maximally accurate'. Therefore, if we consider that we go faster in a car, then we will tend to consume more fuel, just like more entropy implying more accuracy. But the truth is reversed – increased entropy does not necessarily mean greater accuracy of a clock. (4) is contradicting the statement, moreover, it is concerned with the amount of heat produced. (2) and (3) are out of context, they do not validate the context.

Therefore, it can be inferred that if you go faster in a car, you will tend to consume more fuel, but the converse is not necessarily true. In the same way, increased entropy does not necessarily mean greater accuracy of a clock.

**17. Option (3) is correct.**

The passage encapsulates the idea that the view that hard work is a virtue, has led people into meaningless jobs and endless activity. It is often believed by many that hard work has made us prosperous and also brought innovation and labour which have lessened life's drudgery. This is brilliantly established in (3). The argument in (2) that hard work has been glorified to the extent that it has become meaningless, and led to greater idleness is baseless. The necessity of hard work for economic progress is an overstatement, which is not implied in the passage. Hence (4) is incorrect. The first clause in (1) is appropriate, while the second clause is an opinion that is not obscurely stated.

**18. Option (2) is correct.**

The passage is a testimony to the fact that with rising incomes, higher minimum wages and very low unemployment, Brazil has witnessed economic stabilization and improved social security. On the other hand, poor Brazilians paying the biggest share of their income in taxes and getting the least back in government services. This idea is illustrated in (2) – Most Brazilians feel they have benefitted from recent economic events, but the poor continue to be dealt unfairly by the state. The assertion that economic reforms have benefitted many Brazilians cannot be ascertained, hence (3) is incorrect. The clause in (1) stating that most Brazilians are being misled into thinking that their economy is doing well, is an unjustified opinion. The argument in (4) that unfair taxation of the poor that is likely to destabilise the Brazilian economy in the next few years is not implicit in the passage.

**19. Correct answer is [2314].**

(1) brings into context, the share of interpersonal communication in relationships and that scholars should attend to relational histories in their analyses. This analysis is referred in (3) – Foucauldian approach to relationships

goes beyond 'these conceptions of discourse', thus establishing macrolevel regimes of truth as constituting relationships. This regime of truth is explained in (1). Thus the correct link is 2-3-1, therefore (4) ends the paragraph.

**20. Option (3) is correct.**

(2) introduces the subject – Chinese business schools being dissimilar from their Western rivals. (1) continues logically to validate the divergence. Even their business courses now largely cater to the growing demand from China Inc as given in (5). This is a big attraction for students. All options, except (3) talks of Chinese schools and their offerings on business course. (3) deals with Western schools which makes it the odd-one out.

**21. Correct answer is [3214].**

(3) states the problem – museums in Europe are taking steps to return artefacts but not wanting to lose their prized collections. 'This' decision is the outcome of the mounting pressures on European museums to return their precious artefacts looted by colonisers in the past. Thus 3-2 is a mandatory link. This kind of restitution of artefacts to original cultures could face legal obstacles (1), despite these legal hurdles, politicians and institutions in France and Germany are now backing the return of part of their holdings. Therefore, 1-4 is a convincing pair.

**22. Option (4) is correct.**

It is evident that the passage talks of gender inequality. It starts with (3) – gender inequality in the technology sector because technology designs embody the values of their makers. This is illustrated in (1) – in Wikipedia, where the overwhelming majority of contributors are male and so the available content is skewed to reflect their interests. If this continues, then new technologies are unlikely to accommodate the diverse social contexts within which they operate (5). This exhibits the lack of diversity of thought and representation, thus augmenting existing inequalities (2).

**23. Option (1) is correct.**

The passage focuses on intuitive decisions that are based on data. On spotting patterns,

the body starts firing neurochemicals in both the brain and gut, which give us that instant sense that something is right. To conclude, our intuition draws from decades of diverse qualitative experience. This essence is well captured in (1). The conclusion drawn in (3) that intuitions are automatic processes and are therefore faster than rational thought is incorrect. (4) is incorrect to assert that intuition may not be related to data. (2) cannot be substantiated from the passage, that intuition is infinitely richer than big data.

**24. Correct answer is [3412].**

(3) starts with a promise made by politicians frequently – reducing globalisation and immigration will improve the availability of jobs nationally. (4) refutes this argument – the bigger threat to jobs now is not globalisation but automation. Automation, as a threat to business has been explained in (1). (2) gives an additional perspective on automation – it not only endangers the manual jobs, but also acts as a menace for white-collar and service-sector workers. Therefore, 3412 is a logical answer.

## Data Interpretation and Logical Reasoning (DILR)

### Solution for Questions 1 to 6:

The distance thrown by players in Round 1 has given in paragraph and rest have thrown invalid throw. So distance covered by them would be 0 as already given in the question.

For round 2 the ranks would be according to the distance covered in round 1 and those, who have invalid throws would be ranked as per their ranking after Round 1.

In Round 2, only the last two scores are valid and rest have invalid scores, its means that P8 and P10 has valid scores and rest have invalid. Both P8 and P10 have qualified for 2<sup>nd</sup> stage it means that both of them were in Top 6 after the 3<sup>rd</sup> Round.

It is given that there are two instances of Double. It can be observed that from Round 1 to 2 there is no instance of double.

In stage 2 (Round 4 to 6) first ranker will throw at last and vice versa. From Round 4 to Round 5 and Round 5 to Round 6, to have a double one must be 1<sup>st</sup> ranker in either Round 4 or Round 5 and last ranker for next round.

Above mentioned Case is not possible because to become last ranker from first, the all other 5 competitors must cross his score which is not possible because there is improvement in score of only one person in Round 4, Round 5 and Round 6.

So, the double is possible only from Round 2 to Round 3 and Round 3 to Round 4.

To have a situation of double from Round 2 to Round 3, P10 must be top ranker in Round 3. For this situation P10 have to cross the score of 1<sup>st</sup> ranker of Round 2 and the score of P10 must be greater than 87.2 in Round 2 to become 1<sup>st</sup> thrower in Round 3.

Out of P8 and P10 one must be at 6<sup>th</sup> Rank after Round 3 to qualify for Round 4 and this means that P8 score more than P6 till the end of Round 3. Then, the score of P8 after round 3 must be greater than 82.5.

The players qualified for Stage 2 is: P10, P7, P5, P9, P1 and P8. 6<sup>th</sup> ranker of Round 3 (P8) will throw first in Round 4. First ranker after Round 3 will come at last in Round 4; it can be either P10 or P1. We know that, last two of Round 2 does not win any medal and if we suppose the P10 as 1<sup>st</sup> ranker in Round 4 than it will be impossible for 3 medal winners to cross the score of P10. So, P1 is ranked 1<sup>st</sup> in Round 4 and will throw at last.

Round 1			Round 2			Round 3			Round 4			Round 5			Round 6		
Rank	Scores in Round 1	Max Score till Round after Round 1	Rank	Scores in Round 2	Max Score till Round after Round 2	Rank	Scores in Round 3	Max Score till Round after Round 3	Rank	Scores in Round 4	Max Score till Round after Round 4	Rank	Scores in Round 5	Max Score till Round after Round 5	Rank	Scores in Round 6	Max Score till Round after Round 6
P1	82.9	82.9	P7	0	87.2	P10	0	>87.2	P8								
P2	0	0	P5	0	86.4	P7	0	87.2	P9								
P3	81.5	81.5	P9	0	84.1	P5	0	86.4	P5								
P4	0	0	P1	0	82.9	P9	81.4	84.1	P7								
P5	86.4	86.4	P6	0	82.5	P1	88.6	88.6	P10								
P6	82.5	82.5	P3	0	81.5	P8	0	>82.5	P1								
P7	87.2	87.2	P2	0	0	P6	0	82.5									
P8	0	0	P4	0	0	P3	79	81.5									
P9	84.1	84.1	P8	>82.5	>82.5	P2	0	0									
P10	0	0	P10	>87.2	>87.2	P4	0	0									

Gold and Bronze winners improved scores in 5<sup>th</sup> and 6<sup>th</sup> round respectively. One medal winner improved in round 4 and it can be by either of three medal winners. Possible medal winners are P1, P9, P5 and P7.

Scores After Round 3	
P1	88.6
P5	86.4
P7	87.2
P9	84.1

We know that there is exactly one improvement in Round 4, Round 5, Round 6 and that too with a same margin. It is also given that the gap between scores of Gold winner and Silver winner as well as Silver winner and Bronze winner is 1. From these two conditions it can be conclude that 3 winners should have approximate difference of 1 and in this condition P9 is ruled out. So the only possible winners are P1, P5 and P7.

If P1 wins either Gold or Bronze, than the gap after 6<sup>th</sup> round between P1 and others will become much more than 1, It concludes that P1 will be a Silver winner. From here also 2 cases are possible.

**Possibility 1:** P7 won Bronze and P5 won Gold

Bronze	Silver	Gold
P7	P1	P5
87.6	88.6	89.6

P7 which was 87.2 need 0.4 to become 87.6 and P5 need jump of 3.2. It means P5 need 8 jumps of 0.4 to become 3.2 but the maximum jump can be of 2 only.

**Possibility 2:** P5 won Bronze and P7 won Gold

Bronze	Silver	Gold
P5	P1	P7
87.6	88.6	89.6

P5 which was 86.4 need jump of 1.2 to become 87.6 and P7 need jump of 2.4 which mean the gold winner has increased with 1.2 two times it is satisfying the given conditions. It means P7 improved 2 times by 1.2 each in round 4 and Round 5. P5 has improved by 1.2 in round 6.

After the above possible situation the table is as follows,

Round 1			Round 2			Round 3			Round 4			Round 5			Round 6		
Rank	Scores in Round 1	Max Score till Round after Round 1	Rank	Scores in Round 2	Max Score till Round after Round 2	Rank	Scores in Round 3	Max Score till Round after Round 3	Rank	Scores in Round 4	Max Score till Round after Round 4	Rank	Scores in Round 5	Max Score till Round after Round 5	Rank	Scores in Round 6	Max Score till Round after Round 6
P1	82.9	82.9	P7	0	87.2	P10	0	>87.2	P8	0	>82.5	P8	0	>82.5	P8	0	>82.5
P2	0	0	P5	0	86.4	P7	0	87.2	P9	0	84.1	P9	0	84.1	P9	0	84.1
P3	81.5	81.5	P9	0	84.1	P5	0	86.4	P5	0	86.4	P5	0	86.4	P10	0	>87.2
P4	0	0	P1	0	82.9	P9	81.4	84.1	P7	88.2	88.4	P10	0	>87.2	P5	87.6	87.6 (B)
P5	86.4	86.4	P6	0	82.5	P1	88.6	88.6	P10	0	>87.2	P7	89.6	89.6	P1	0	88.6 (S)
P6	82.5	82.5	P3	0	81.5	P8	0	>82.5	P1	0	88.6	P1	0	88.6	P7	0	89.6 (G)
P7	87.2	87.2	P2	0	0	P6	0	82.5									
P8	0	0	P4	0	0	P3	79	81.5									
P9	84.1	84.1	P8	>82.5	>82.5	P2	0	0									
P10	0	0	P10	>87.2	>87.2	P4	0	0									

**1. Option (1) is correct.**

As per the data given in the table,  
Two players who got double = P10 and P8

**2. Option (3) is correct.**

As per the data given in the table,  
Winner of silver medal= P1

**3. Option (4) is correct.**

As per the data given in the table,  
Last javelin thrower in the event = Winner of Gold Medal= P7

**4. Option (2) is correct.**

As per the data given in the table,  
Final score of silver medalist = 88.6

**5. Option (4) is correct.**

As per the data given in the table,  
P8 score must be greater than 82.5 and in Round 6 it is clearly visible that P9 who has score of 84.1 has ranked above than P8, it means that the score of P8 will be less than 84.1.

$84.1 > \text{Score of P8} > 82.5$ , the only value possible is 82.7.

**6. Option (1) is correct.**

As per the data given in the table,  
Score improved by Gold medalist =  $2 \times 1.2 = 2.4$

**Solution for Questions 7 to 10:**

**7. Option (4) is correct.**

As per the data given in the graph,  
The total project month for all four employees is 9 each. So, statement I is correct.  
Total employee month for project 1, project 2, project 3, project 4 and project 5 are 6, 5, 9, 10 and 6 respectively. So statement II is incorrect.  
Hence, only I is the correct answer.

**8. Option (4) is correct.**

As per the data given in the graph,  
In September, Tinni has worked simultaneously

on project 4 and project 5. Abani, Bahni and Danni have not worked in multiple projects for any of the month in 2020.

**9. Option (4) is correct.**

As per the data given in the graph,  
Project duration of project 1, project 3, project 4 and project 5 are 3, 5, 5 and 4 respectively.  
Project 3 and project 4 has the same duration.

**10. Option (1) is correct.**

As per the data given in the graph,  
Completion index of Abani =  $(100 \times 2 + 100 \times 2 + 80 \times 5)/9 \rightarrow 88.88$

$$\text{Completion Index of Bahni} = (100 \times 2 + 75 \times 4 + 90 \times 3)/9 \rightarrow 85.55$$

$$\text{Completion Index of Tinni} = (80 \times 2 + 100 \times 2 + 100 \times 3 + 100 \times 2)/9 \rightarrow 95.55$$

$$\text{Completion index of Danni} = (90 \times 3 + 100 \times 3 + 100 \times 2 + 100 \times 1)/9 \rightarrow 96.66$$

Decreasing order as per weighted average = Danni, Tinni, Abani, Bahni

### Solution for Questions 11 to 16:

We can put Statement 1, 2, 3 and 4 directly in the below table.

It is definite that if a question is reviewed by all three it must be created by SME.

	Reviewed By			Accepted/ Rejected	Created By
Q01			Komal	✓	
Q02	Amal	Bimal	Komal	✗	SME
Q03	Amal		Komal	✓	
Q04	Amal	Bimal	Komal	✓	SME
Q05			Komal	✓	
Q06	Amal	Bimal		✗	
Q07		Bimal	Komal	✓	
Q08	Amal	Bimal	Komal	✓	SME
Q09		Bimal	Komal	✗	
Q10	Amal			✓	
Q11	Amal		Komal	✗	
Q12		Bimal	Komal	✗	
Q13	Amal	Bimal		✓	

Person who approved the question will be represented by (A), not Approved by (NA).

Q01 only reviewed by Komal and it is accepted, this can only happen when the question is created by Bimal and Komal approved it.

Q02 is reviewed by all three and at last it is not accepted, it means that either of the Amal and Bimal approved or disapproved the question and Komal definitely rejected it.

Q03 is reviewed by Amal and Komal only and this can happen only when the question is created by Bimal. The question is accepted and reviewed by only 2 people, it means that the Komal must have rejected and Amal accepted it.

Q04 is reviewed by all three and at last it is accepted, it means that either of the Amal and Bimal approved or disapproved the question and Komal definitely accepted it.

Q05 is reviewed by Komal only and it is accepted which means that the question has been created by Bimal and Komal has approved it.

Q06 only Amal and Bimal have reviewed the question and at last it is rejected it means that question has been created by either Komal or SME and both Amal and Bimal must have rejected the question.

Q07 has been reviewed by Bimal and Komal only and at last it is rejected. It means that question must be created by Amal and Bimal must have rejected it and Komal must have accepted it.

Q08 has been created SME and at last the question has been accepted. It means that Komal must have been accepted the question and either Amal or Bimal have accepted or rejected the question.

Q09 has been reviewed by Bimal and Komal only and at last it is rejected. It means that question must have been created by Amal and both Bimal and Komal have rejected the question.

Q10 has been reviewed by Amal and at last it is accepted. It means that the question must have been created by Komal and Amal has accepted the question.

Q11 has been reviewed by Amal and Komal only and at last it is rejected. It means that the question must be created by Bimal and both Amal and Komal rejected the question.

Q12 has been reviewed by Bimal and Komal only and at last it is rejected. It means that the question must be created by Amal and both Bimal and Komal have rejected the question.

Q13 has been reviewed by Amal and Bimal only and at last it is accepted. It means that the question is created by either Komal or SME. Bimal must have accepted the question and Amal can have both possibilities of acceptance and rejection.

	Reviewed By		Accepted/ Rejected	Created By
Q01		Komal (A)	✓	Bimal
Q02	Amal (A/NA)	Bimal (A/NA)	✗	SME
Q03	Amal (A)		✓	Bimal
Q04	Amal (A/NA)	Bimal (A/NA)	✓	SME
Q05		Komal (A)	✓	Bimal
Q06	Amal (NA)	Bimal (NA)	✗	Komal/SME
Q07		Bimal (NA)	✓	Amal
Q08	Amal (NA/A)	Bimal (NA/A)	✓	SME
Q09		Bimal (NA)	✗	Amal
Q10	Amal (A)		✓	Komal
Q11	Amal (NA)		✗	Bimal
Q12		Bimal (NA)	✗	Amal
Q13	Amal (A/NA)	Bimal (A)	✓	SME/ Komal

**11. Correct answer is [3].**

As per the data given in the table,

Questions definitely created by Amal = Q07,  
Q09 and Q12

Number of question = 3

**12. Correct answer is [1].**

As per the data given in the table,

Questions definitely created by Komal = Q10  
Number of question = 1

**13. Correct answer is [3].**

As per the data given in the table,

Questions definitely created by SME = Q02,  
Q04, Q08

Number of question = 3

**14. Option (2) is correct.**

As per the data given in the table,

Questions definitely disapproved by Bimal  
= Q06, Q07, Q09, Q12

Number of question = 4

**15. Option (4) is correct.**

As per the data given in the table,

Number of questions reviewed by Amal = 8  
Minimum number of questions Amal can  
approve = 2 (Q3 and Q10)

Maximum number of questions Amal can  
approve = Number of question reviewed  
– Number of questions definitely rejected  
= 8 – 2 → 6

Minimum value of Approval Ratio = 2/8 → 0.25

Maximum value of Approval Ratio =  $6/8 \rightarrow 0.75$

So, the value of approval ratio of Amal will lie between 0.25 to 0.75.

**16. Option (2) is correct.**

As per the data given in the table,  
Questions created by Amal and rejected by at least one other reviewer = Q07, Q09 and Q12  
Questions created by Bimal rejected by at least one other reviewer = Q03 and Q11  
Required Number of question = 5

**Solution for Questions 17 to 20:**

It is given that testing device detects impurity only when the percentage of impurity is 10% or more, this can also be understood as that the testing device cannot detect purity greater than 90%.

**17. Option (3) is correct.**

As per the data given in the question,

Bottle A contains only P which means 100% purity.

5 ml of Bottle A mixed with 5 ml of Bottle B, the ratio of quantities of fluid A and B in mixture =  $5 : 5 \rightarrow 1 : 1$

Let the 100% purity of A is mixed with  $x\%$  purity of B,

Purity in mixture  $\leq 90\%$  (As the device can detect maximum 90% purity) =  $(100\% + x\%)/2 \leq 90 \rightarrow x \leq 80\%$

So, impurity in B will be  $\geq 20\%$  of mixture B or  $\geq 10 \text{ ml}$  (As it is given that each bottle contains 50 ml)

**18. Correct answer is [1].**

As per the data given in the question,

Ready for dispatch if all of them contain only P. Let there are 3P and 1I, then their weighted average =  $75\%P$ , which means it will get detected.

In 1st test if is detected than it means at least 1 I is there or if not detected it would mean it has all 4 P.

So, minimum required tests = 1

**19. Correct answer is [2].**

As per the data given in the question,

Let the name of bottles A, B, C and D

Taking any two bottles, let A and B, now there can be two cases.

**Case 1:** If it is okay then, we will take C with A. If test of A and C is okay, it would be mean D is with I and if not okay than C is with I.

**Case 2:** If test A and B in starting was impure than we will test A + C, if this is also impure it means A is impure but if A and C is pure than B was the impure bottle.

Hence, the minimum number of test required is 2.

**20. Option (4) is correct.**

As per the data given in the question,

Out of four bottles either 1 or 2 contain only P. (Given)

**Case 1:** Let the number of bottle with only P is 2. So, number of bottles containing 85% P will be 2.

Weighted average =  $370/4$  greater than 90 which means impurity will not be detected.

**Case 2:** Let the number of bottle with only P is 1. So, number of bottles containing 85% P will be 3.

Weighted average =  $355/4$  less than 90 which means impurity will be detected.

If we test all four together and if impurity come it means there is 1 P and 3I and if not detected I would mean there are 2 Is and 2 Ps.

Hence, number of tests required = 1

## Quantitative Aptitude (QA)

**1. Correct answer is [50].**

The total number of four-digit numbers that can be formed = 4!

It is given that both 2 and 3 must appear at least once while forming the four-digit number using the digits 1, 2 and 3.

It means that 2 and 3 can appear twice and thrice also.

We know that if out of ' $n$ ' things, ' $p$ ' things are alike of one kind and ' $q$ ' things are alike of another kind, then the number of permutations of ' $n$ ' things, taken all at a time =  $\frac{n!}{p!q!}$

Therefore, for the given condition, the following arrangements are possible:

1, 1, 2, 3 can be arranged in  $\frac{4!}{2!} = 12$  ways

1, 2, 2, 3 can be arranged in  $\frac{4!}{2!} = 12$  ways

1, 3, 3, 2 can be arranged in  $\frac{4!}{2!} = 12$  ways

2, 2, 3, 3 can be arranged in  $\frac{4!}{2!2!} = 6$  ways

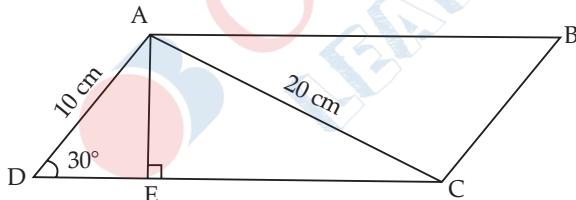
2, 2, 2, 3 can be arranged in  $\frac{4!}{3!} = 4$  ways

3, 3, 3, 2 can be arranged in  $\frac{4!}{3!} = 4$  ways

Hence, the total number of such four-digit numbers =  $12 + 12 + 12 + 6 + 4 + 4 = 50$

## 2. Option (1) is correct.

Given:



$\square ABCD$  is a parallelogram

$$AD = 10 \text{ cm}$$

$$AC = 20 \text{ cm}$$

$$\angle ADC = 30^\circ$$

Draw  $AE \perp DC$ , where  $AE$  is the height of the parallelogram  $ABCD$  and  $DC$  is its base.

$$AE \perp DC$$

$$\therefore \angle AED = 90^\circ$$

So,  $\triangle AED$  is a  $30^\circ - 60^\circ - 90^\circ$  triangle, where the sides opposite to  $30^\circ, 60^\circ$  and  $90^\circ$  are in the ratio

of  $1 : \sqrt{3} : 2$

$$\therefore AD = 2 AE$$

$$\Rightarrow 10 = 2 AE$$

$$\Rightarrow AE = 5 \text{ cm} \quad \dots(i)$$

$$DE = \sqrt{3} AE$$

$$\Rightarrow DE = \sqrt{3} \times 5$$

$$\Rightarrow DE = 5\sqrt{3} \text{ cm} \quad \dots(ii)$$

In  $\triangle AEC$ , applying Pythagoras theorem,

$$(AE)^2 + (EC)^2 = (AC)^2$$

$$\Rightarrow 5^2 + (EC)^2 = (20)^2 \quad \{\text{from (i)}\}$$

$$\Rightarrow (EC)^2 = 375$$

$$\Rightarrow EC = 5\sqrt{15} \text{ cm} \quad \dots(iii)$$

$$DC = DE + EC$$

$$= 5\sqrt{3} + 5\sqrt{15}$$

$$\{\text{from (ii) and (iii)}\}$$

$$= 5(\sqrt{3} + \sqrt{15}) \text{ cm}$$

$$\boxed{\text{Area (parallelogram)} = \text{Base} \times \text{Height}}$$

$$\text{Area (parallelogram } ABCD) = DC \times AE$$

$$= 5(\sqrt{3} + \sqrt{15}) \times 5$$

$$= 25(\sqrt{3} + \sqrt{15}) \text{ sq. cm.}$$

## 3. Option (3) is correct.

Given: Bank A provides compound interest (C.I.) while Bank B and Bank C provide simple interest (S.I.).

The rate of interest at Bank A = 6% per annum compounded half yearly

Let the rate of interest at Bank B be R%

So, the rate of interest at Bank C = 2 R%

Suppose Raju invests principal 'P' in Bank B for ' $n$ ' years.

So, Rupa invests ₹10,000 in Bank C for '2n' years.

For Raju,

S.I. in Bank B for ' $n$ ' years = C.I. in Bank A for one year

$$\frac{P \times R \times n}{100} = P \left( 1 + \frac{\frac{R}{2}}{100} \right)^{2 \times 1} - P$$

$$\Rightarrow \frac{R \times n}{100} = (1.03)^2 - 1$$

$$\Rightarrow R \times n = 6.09 \quad \dots(i)$$

Rupa invests ₹10,000 in Bank C at  $2R\%$  for  $2n$  years.

So For Rupa,

$$\text{Simple Interest (S.I.)} = \frac{10000 \times 2R \times 2n}{100}$$

$$= 100 \times 4 \times R \times n$$

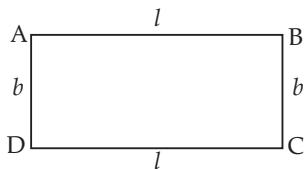
$$= 400 \times 6.09 \quad \{\text{from (i)}\}$$

$$= ₹2436$$

Hence, the interest accrued to Rupa is ₹2436.

**4. Option (1) is correct.**

Given:



Let ABCD be the rectangular plot.

Area ( $\square ABCD$ ) = 60,000 sq. ft. (given)

Let the length and the breadth of the plot be  $l$  and  $b$ , respectively.

The cost of fencing is ₹200 per ft. for one side and ₹100 per ft. for the remaining three sides of the plot.

$$\begin{aligned} \text{Total cost of fencing} &= 200 \times b + 100 \times b + 100 \\ &\quad \times l + 100 \times l \\ &= 200l + 300b \end{aligned}$$

To get the lowest possible cost of fencing,  $200l$  must be equal to  $300b$ .

**Concept:** If the product of the variables is constant, the sum is minimum when all of them are equal.

$$\therefore \text{Let } 200l = 300b = a \quad \dots(i)$$

$$\text{Area } (\square ABCD) = 60,000$$

$$\Rightarrow l \times b = 60,000$$

$$\Rightarrow \frac{a}{200} \times \frac{a}{300} = 60,000$$

$$\Rightarrow a = 60,000$$

$$\text{From (i), } 200l = 60,000$$

$$\Rightarrow l = \frac{60,000}{200}$$

$$\Rightarrow l = 300$$

$$\text{From (ii), } 300b = 60,000$$

$$\Rightarrow b = \frac{60,000}{300}$$

$$\Rightarrow b = 200$$

Lowest possible cost of fencing

$$\begin{aligned} &= 200 \times 300 + 300 \times 200 \\ &= 60000 + 60000 \\ &= ₹12,0000 \end{aligned}$$

Hence, the lowest possible cost of fencing all four sides is ₹12,0000.

**5. Option (4) is correct.**

$$\text{Given: } \frac{\log_{15}^a + \log_{32}^a}{(\log_{15}^a)(\log_{32}^a)} = 4$$

$$\Rightarrow \frac{\frac{\log a}{\log 15} + \frac{\log a}{\log 32}}{\frac{\log a}{\log 15} \times \frac{\log a}{\log 32}} = 4 \quad \left( \because \log_n m = \frac{\log m}{\log n} \right)$$

$$\begin{aligned} &\Rightarrow \frac{\log 32 + \log 15}{\log 15 \times \log 32} = 4 \\ &\Rightarrow \frac{\log a}{\log 15 \times \log 32} = 4 \\ &\Rightarrow \frac{\log(32 \times 15)}{\log a} = 4 \\ &\quad (\because \log a + \log b = \log(a \times b)) \end{aligned}$$

$$\Rightarrow \frac{\log 480}{\log a} = 4$$

$$\Rightarrow \log_a 480 = 4 \quad \left( \because \frac{\log m}{\log n} = \log_n m \right)$$

$$\Rightarrow a^4 = 480$$

$$\text{Now, } 4^4 = 256 \text{ and } 5^4 = 625$$

Hence,  $a$  must lie in the range  $4 < a < 5$ .

**6. Correct answer is [6].**

$$\text{Given: } (7\sqrt{10})(7\sqrt{10})^2 \dots (7\sqrt{10})^n > 999,$$

where  $n$  is a positive integer

$$\Rightarrow 10^{\frac{1}{7}} \times 10^{\frac{2}{7}} \times \dots \times 10^{\frac{n}{7}} > 999$$

$$\Rightarrow 10^{\left(\frac{1+2+\dots+n}{7}\right)} > 999$$

$$\Rightarrow 10^{\left(\frac{1+2+\dots+n}{7}\right)} > 999$$

$$\Rightarrow 10^{\frac{n(n+1)}{2 \times 7}} > 999$$

$\therefore$  Sum of first  $n$  natural numbers is  $\frac{n(n+1)}{2}$ .

To get the smallest value of  $n$ , consider the number which is least greater than 999 and is also such number is 1000.

$$10^{\left[\frac{n(n+1)}{14}\right]} = 1000$$

$$\Rightarrow 10^{\left[\frac{n(n+1)}{14}\right]} = 10^3$$

Comparing the indices,

$$\frac{n(n+1)}{14} = 3$$

$$\Rightarrow n^2 + n - 42 = 0$$

$$\Rightarrow (n+7)(n-6) = 0$$

$$\Rightarrow n+7 = 0 \text{ or } n-6 = 0$$

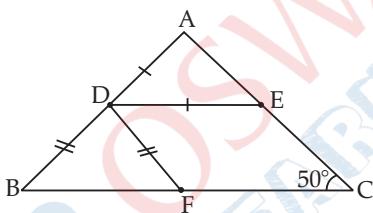
$$\Rightarrow n = -7 \text{ or } n = 6$$

But,  $n$  is a positive integer (given)

Hence,  $n = 6$

#### 7. Option (3) is correct.

Given:



In  $\triangle ABC$ ,  $\angle C = 50^\circ$

$AD = DE$

So, let  $\angle DEA = \angle DAE = x^\circ$

$$\Rightarrow \therefore \angle ADE = 180^\circ - 2x \quad \dots(i)$$

Also,  $DB = DF$

So, let  $\angle DFB = \angle DBF = y^\circ$

$$\therefore \angle BDF = 180^\circ - 2y \quad \dots(ii)$$

In  $\triangle ABC$ ,  $\angle A + \angle B + \angle C = 180^\circ$

$$x^\circ + y^\circ + 50^\circ = 180^\circ$$

$$\Rightarrow x + y = 130^\circ \quad \dots(iii)$$

$$\angle ADE + \angle FDE + \angle BDF = 180^\circ$$

(Angles in a linear pair)

$$(180^\circ - 2x) + \angle FDE + (180^\circ - 2y) = 180^\circ$$

{from (i) and (ii)}

$$\begin{aligned} \Rightarrow \angle FDE - 2(x + y) &= -180 \\ \Rightarrow \angle FDE - 2 \times 130 &= -180 \quad \{ \text{from (iii)} \} \\ \Rightarrow \angle FDE &= 260 - 180 \\ \Rightarrow \angle FDE &= 80^\circ \end{aligned}$$

#### 8. Correct answer is [3000].

Given: Anil can paint a house in 12 days.

Barun can paint a house in 16 days.

Let Chandu paint a house in  $x$  days.

House painted by Anil, Barun and Chandu together in 1 day  $= \frac{1}{12} + \frac{1}{16} + \frac{1}{x}$ .

The three of them together complete the painting in 6 days

$$\begin{aligned} 6\left(\frac{1}{12} + \frac{1}{16} + \frac{1}{x}\right) &= 1 \\ \Rightarrow \frac{1}{2} + \frac{3}{8} + \frac{6}{x} &= 1 \\ \Rightarrow \frac{6}{x} &= 1 - \frac{7}{8} \\ \Rightarrow \frac{6}{x} &= \frac{1}{8} \\ \Rightarrow x &= 48 \end{aligned}$$

Therefore, Chandu can paint a house in 48 days.

House painted by Chandu in 6 days

$$= 6 \times \frac{1}{48} = \frac{1}{8}$$

So, Chandu will receive the amount in the proportion of  $\frac{1}{8}$ .

Total amount received = ₹24,000 (given)

Hence, the amount received by Chandu

$$\begin{aligned} &= \frac{1}{8} \times 24,000 \\ &= ₹3,000 \end{aligned}$$

#### 9. Correct answer is [92].

Sum of the scores of 25 students

= Arithmetic mean of scores of 25 students  $\times 25$

$$= 50 \times 25$$

$$= 1250$$

Five students among these 25, topped the examination with the same score.

Let that score be  $x$ .

Therefore, the total score of the top five students =  $5x$

To get the maximum possible score of the toppers, the scores of the remaining 20 students must be minimum.

The lowest score among 20 students is given as 30.

Hence, the other 19 scores will be 31, 32 and so on. Thus, the scores of the 20 students is in arithmetic progression.

30, 31, 32,.....

Here, total number of turns ( $n$ ) = 20

the first term ( $a$ ) = 30

the common difference ( $d$ ) = 1

Sum of the scores of the 20 students,

$$S_{20} = \frac{n}{2}[2a + (n-1)d]$$

$$\Rightarrow S_{20} = \frac{20}{2}[2 \times 30 + (20-1) \times 1]$$

$$\Rightarrow S_{20} = 10(60 + 19)$$

$$\Rightarrow S_{20} = 790$$

$$\begin{aligned} \text{The total score of the toppers} &= 1250 - 790 \\ &= 460 \end{aligned}$$

Hence, the maximum possible score of the toppers

$$\begin{aligned} &= \frac{460}{5} \\ &= 92 \end{aligned}$$

**10. Option (3) is correct.**

Given:  $f(x) = x^2 - 7x$

$$g(x) = x + 3$$

$$\begin{aligned} f(g(x)) - 3x &= (x+3)^2 - 7(x+3) - 3x \\ &= x^2 + 9 + 6x - 7x - 21 - 3x \\ &= x^2 - 4x - 12 \end{aligned}$$

We know that the minimum value of a quadratic

function  $ax^2 + bx + c$  is given by  $\frac{-D}{4a}$

where D is discriminant  $b^2 - 4ac$ .

For  $x^2 - 4x - 12$ ,

$$a = 1$$

$$D = b^2 - 4ac$$

$$= (-4)^2 - 4 \times 1 \times -12$$

$$= 64$$

Hence, the minimum value of  $f(g(x)) - 3x$  i.e.,

$$x^2 - 4x - 12$$

$$= \frac{-D}{4a}$$

$$= \frac{-64}{4 \times 1}$$

$$= -16$$

**11. Correct answer is [8].**

Let the circumference of the circular track be  $x$  meters.

Let the speeds of Amal and Mira along the circular track be  $v_1$  and  $v_2$ , respectively.

$$\text{Relative speed} = \frac{\text{Distance}}{\text{Time}}$$

While walking in the same direction, Amal completes three more rounds than Mira, in 45 minutes.

$$\text{Thus, } v_1 - v_2 = \frac{3x}{45} = \frac{x}{15} \text{ metres per minute ... (i)}$$

While walking in the opposite direction, Amal and Mira meet for the first time after 3 minutes.

$$\text{Thus, } v_1 + v_2 = \frac{x}{3} \text{ meters per minute ... (ii)}$$

Subtracting (i) from (ii)

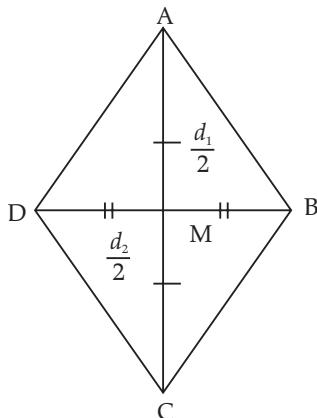
$$2v_2 = \frac{x}{3} - \frac{x}{15}$$

$$\Rightarrow v_2 = \frac{2x}{15} \text{ meters per minute}$$

Thus, in 15 minutes, Mira completes 2 Rounds  
So, in 1 hour, Mira completes  $2 \times 4 = 8$  Rounds  
Hence, the number of Rounds Mira completes in one hour is 8.

**12. Correct answer is [3500].**

Given:



Let ABCD be a rhombus - shaped park.

$$\text{Area} (\square ABCD) = 96 \text{ sq.m.}$$

Let  $d_1$  and  $d_2$  be the diagonals of  $\square ABCD$ .

40 m of fencing is needed to enclose the park.

$\therefore$  Perimeter of the park = 40 m

$$4 \times \text{side} = 40$$

$$\Rightarrow \text{side} = \frac{40}{4} = 10 \text{ m}$$

$$\therefore AD = 10 \text{ m} \quad \dots(\text{i})$$

$\text{Area of a rhombus} = \frac{\text{Product of its diagonals}}{2}$
--

$$\text{Area} (\square ABCD) = \frac{d_1 \times d_2}{2}$$

$$96 = \frac{d_1 \times d_2}{2}$$

$$\Rightarrow d_1 \times d_2 = 192 \quad \dots(\text{ii})$$

We know that the diagonals of a rhombus bisect each other at right angles.

Thus, triangles AMD is a right-angled triangle

Applying Pythagoras theorem to triangle AMD,  
 $AM^2 + DM^2 = AD^2$

$$\Rightarrow \left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2 = 10^2 \quad \{\text{from (i)}\}$$

$$\Rightarrow d_1^2 + d_2^2 = 400$$

$$\Rightarrow d_1^2 + d_2^2 + 2 \times d_1 d_2 = 400 + 2 \times d_1 d_2$$

$$\Rightarrow (d_1 + d_2)^2 = 400 + 2 \times 192 \quad \{\text{from (ii)}\}$$

$$\Rightarrow (d_1 + d_2)^2 = 784$$

$$\Rightarrow d_1 + d_2 = 28$$

Thus, the total lengths of the two diagonals  
 $= 28 \text{ m}$

Therefore, the cost of laying electric wires along its two diagonals, at the rate of ₹125 per m.

$$= 28 \times 125$$

$$= ₹3500$$

**13. Option (2) is correct.**

Given: The number of the matches played so far = 40

The number of the matches won so far

$$= 30\% \text{ of } 40$$

$$= \frac{30}{100} \times 100$$

$$= 12 \quad \dots(\text{i})$$

Let the number of the remaining matches be  $x$

Therefore, the total number of matches

$$= (40 + x)$$

**Case I:** The number of the matches won among the remaining  $x$  matches = 60% of  $x$

$$= \frac{60}{100} \times x$$

$$= \frac{3x}{5} \quad \dots(\text{ii})$$

The number of the total matches won = 50% of  $(40 + x)$

$$= \frac{50}{100} \times (40 + x)$$

$$= \frac{40 + x}{2} \quad \dots(\text{iii})$$

From (i), (ii) and (iii),

$$12 + \frac{3x}{5} = \frac{40 + x}{2}$$

$$\Rightarrow 120 + 6x = 200 + 5x$$

$$\Rightarrow x = 80$$

Thus, the number of the remaining matches is 80.

**Case II:** The number of the matches won among the remaining 80 matches

$$= 90\% \text{ of } 80$$

$$= \frac{90}{100} \times 80$$

$$= 72$$

Hence, the total number of matches won by the team in the tournament =  $12 + 72$

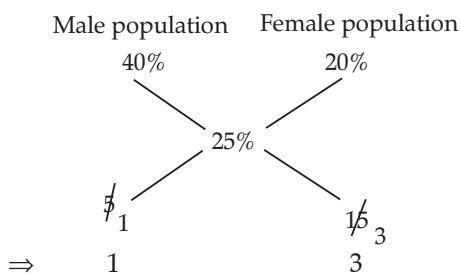
$$= 84$$

**14. Option (1) is correct.**

Given: During the period from 1970 to

1980, the male population increased by 40%, the female population increased by 20%, and the total of male and female populations increased by 25%.

Using the rule of alligation,



It means that, in 1970, the ratio of the male to female population was 1 : 3

Suppose, in 1970, the male population = 100

Then, in 1970, the female population = 300

So, in 1970, the total of male and female population =  $100 + 300 = 400$

$$\text{In 1980, the male population} = 100 + \frac{40}{100} \times 100 \\ = 140$$

In 1980, the female population

$$= 300 + \frac{20}{100} \times 300 \\ = 360$$

During the period from 1980 to 1990,

the female population increased by 25%

So, in 1990, the female population

$$= 360 + \frac{25}{100} \times 360 \\ = 450$$

It is given that, in 1990, the female population is twice the male production.

So, in 1990, the male population =  $\frac{1}{2} \times$  the female population

$$= \frac{1}{2} \times 450 \\ = 225$$

In 1990, the total of male and female population

$$= 450 + 225 \\ = 675$$

Hence, the percentage increase in the total of male and female population in the city from 1970 to 1990

$$= \frac{675 - 400}{400} \times 100$$

$$= \frac{275}{4} \\ = 68.75 \%$$

Hence, the desired percentage increase is 68.75.

**15. Option (2) is correct.**

Given:  $x_{n+1} = x_n + n - 1$  for all  $n \geq 1$

$$x_1 = -1$$

$$\begin{aligned} \text{So, } x_2 &= x_1 + 1 - 1 \\ &= -1 + 0 \\ &= -1 \\ x_3 &= x_2 + 2 - 1 \\ &= -1 + 1 \\ &= 0 \\ x_4 &= x_3 + 3 - 1 \\ &= 0 + 2 \\ &= 2 \\ x_5 &= x_4 + 4 - 1 \\ &= 2 + 3 \\ &= 5 \\ x_6 &= x_5 + 5 - 1 \\ &= 5 + 4 \\ &= 9 \end{aligned}$$

So, the series is

$$\begin{array}{ccccccc} -1, & -1, & 0, & 2, & 5, & 9, & \dots\dots\dots \\ \underbrace{+0}_{\text{+1}}, & \underbrace{-1}_{\text{+1}}, & \underbrace{0}_{\text{+2}}, & \underbrace{2}_{\text{+3}}, & \underbrace{5}_{\text{+4}}, & & \end{array}$$

We can generalise the above series as under:

$$x_{n+1} = [\text{Sum of first } (n-1) \text{ natural numbers}] - 1$$

$$\therefore x_{100} = \text{Sum of first 99 natural numbers} - 1$$

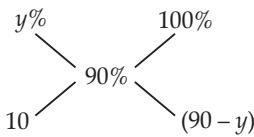
$$\begin{aligned} &= \frac{98 \times 99}{2} - 1 \\ &= 49 \times 99 - 1 \\ &= 4850 \end{aligned}$$

**16. Option (1) is correct.**

Given: An alloy of silver and copper of certain weight is mixed with 3 kg of pure silver to obtain the alloy having 90% silver by weight.

Let the weight of the initial alloy be  $x$  kg and the percentage of silver in the initial alloy be  $y\%$ .

So, using the rule of alligation,

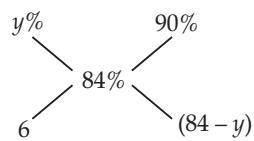


Thus,  $\frac{10}{90-y} = \frac{x}{3}$

$$\Rightarrow 30 = 90x - xy \quad \dots(i)$$

Also, as per the second given condition, the initial alloy is mixed with 2 kg of another alloy having 90% silver to obtain the alloy having 84% silver by weight.

So, using the rule of alligation,



Thus,  $\frac{6}{84-y} = \frac{x}{2}$

$$\Rightarrow 12 = 84x - xy \quad \dots(ii)$$

Subtracting (ii) from (i),

$$30 - 12 = 90x - 84x$$

$$\Rightarrow 18 = 6x$$

$$\Rightarrow x = 3$$

Hence, the weight of the initial alloy is 3 kg.

### 17. Option (4) is correct.

Given: The total number of shirts bought by a shop owner = 64

Let the number of the large shirts and the small shirts be  $m$  and  $n$ , respectively.

$$\therefore m + n = 64 \quad \dots(i)$$

The price of a small shirt was ₹50 less than that of a large shirt.

Let the price of a small shirt be ₹  $x$ .

So, the price of a large shirt = ₹  $(x + 50)$

The total amount paid for the small shirts = ₹1800

$$\therefore n \cdot x = 1800 \quad \dots(ii)$$

The total amount paid for the large shirts = ₹5000

$$\therefore m(x + 50) = 5000 \quad \dots(iii)$$

$$\Rightarrow mx + 50m = 5000$$

$$\Rightarrow (64 - n)x + 50(64 - n) = 5000 \quad \{\text{from (i)}\}$$

$$\Rightarrow 64x - nx + 3200 - 50n = 5000$$

$$\Rightarrow 64x - 1800 + 3200 - 50n = 5000 \quad \{\text{from (ii)}\}$$

$$\begin{aligned} &\Rightarrow 64x - 3600 - 50n = 0 \\ &\Rightarrow 32x - 1800 - 25n = 0 \\ &\Rightarrow 32x - 1800 - 25 \times \frac{1800}{x} = 0 \quad \{\text{from (ii)}\} \\ &\Rightarrow 32x^2 - 1800x - 45000 = 0 \\ &\Rightarrow 4x^2 - 225x - 5625 = 0 \\ &\Rightarrow (4x + 75)(x - 75) = 0 \\ &\Rightarrow 4x + 75 = 0 \text{ or } x - 75 = 0 \\ &\Rightarrow x = \frac{-75}{4} \text{ or } 75 \end{aligned}$$

Since the price can't be negative,

$$x = \frac{-75}{4} \text{ can be discarded}$$

$$\text{Therefore, } x = 75$$

$$\begin{aligned} \text{Hence, the price of a large shirt and a small shirt together,} &= x + (x + 50) \\ &= 75 + (75 + 50) \\ &= ₹200 \end{aligned}$$

### 18. Option (1) is correct.

Let ' $a$ ' and ' $b$ ' be the amount of work that Rahul and Gautam can complete in an hour.

Work done by Rahul from 9 a.m. to 5 p.m., in 8 hours =  $8a$

Work done by Gautam from 11 a.m. to 5 p.m., in 6 hours =  $6b$

$$\text{Thus, } 8a + 6b = 1 \quad \dots(i)$$

Work done by Rahul and Gautam together from 9 a.m. to 4:30 p.m., in 7.5 hours =  $7.5a + 7.5b$

$$\text{Thus, } 7.5a + 7.5b = 1$$

$$15a + 15b = 2 \quad \dots(ii)$$

Multiplying (i) by 5 and (ii) by 2, we get,

$$40a + 30b = 5 \quad \dots(iii)$$

$$30a + 30b = 4 \quad \dots(iv)$$

Subtracting (iv) from (iii),

$$10a = 1$$

$$\Rightarrow a = \frac{1}{10}$$

It means, working alone, Rahul completes  $\frac{1}{10}$  work in an hour.

Hence, the time taken by Rahul to complete the total work while working alone =  $\frac{1}{\frac{1}{10}} = 10$  hours.

### 19. Option (2) is correct.

Let the hostel's fixed monthly expenses be ₹  $x$  and the variable monthly expenses be ₹  $y$  per boarder.

Let the number of boarders be denoted by 'N'  
 $\therefore$  Total monthly expenses =  $x + Ny$

The hostel collects ₹1600 from each boarder  
 So, the total monthly income = 1600 N

Total Profit = Total Income – Total Expenses  
 When N = 50, Total Profit =  $200 \times 50 = ₹10,000$

$$\therefore 10,000 = 1600 \times 50 - (x + 50y) \\ \Rightarrow x + 50y = 70,000 \quad \dots(i)$$

When N = 75

$$\text{Total Profit} = 250 \times 75 = ₹18,750 \\ \therefore 18,750 = 1600 \times 75 - (x + 75y) \\ \Rightarrow x + 75y = 1,01,250 \quad \dots(ii)$$

Subtracting (ii) from (i),

$$25y = 31,250 \\ \Rightarrow y = 1250$$

From (i),  $x + 50 \times 1250 = 70,000$

$$\Rightarrow x = 7500$$

When N = 80,

The total profit of the hostel =  $1600 N - (x + Ny)$

$$= 1600 \times 80 - (7500 + 80 \times 1250) \\ = 128000 - 107500 \\ = ₹20500$$

## 20. Option (3) is correct.

$$\text{Given: } 3x + 2|y| + y = 7 \quad \dots(i) \\ x + |x| + 3y = 1 \quad \dots(ii)$$

Assuming  $x < 0$  and  $y < 0$ , (i) and (ii) becomes,

$$3x - y = 7 \\ 3y = 1$$

Solving the above equations for  $x$  and  $y$ , we get,

$$x = \frac{22}{9} \text{ and } y = \frac{1}{3}$$

Hence, our assumption that  $x < 0$  and  $y < 0$  is wrong.

Assuming  $x < 0$  and  $y > 0$ , (i) and (ii) becomes,

$$3x + 3y = 7 \\ 3y = 1$$

Solving the above equation for  $x$  and  $y$ , we get,

$$x = 2 \text{ and } y = \frac{1}{3}$$

Hence, our assumption that  $x < 0$  is wrong.

Assuming  $x > 0$  and  $y > 0$ , (i) and (ii) becomes,

$$3x + 3y = 7 \\ 2x + 3y = 1$$

Solving the equations for  $x$  and  $y$ , we get,

$$x = 6 \text{ and } y = \frac{-11}{3}$$

Hence, our assumption that  $y > 0$  is wrong.

Assuming  $x > 0$  and  $y < 0$ , (i) and (ii) becomes,

$$3x - y = 7 \\ 2x + 3y = 1$$

Solving the above equations for  $x$  and  $y$ , we get,

$$x = 2 \text{ and } y = -1$$

Hence, our assumption that  $x > 0$  and  $y < 0$  is correct.

$$x + 2y = 2 + 2 \times (-1) \\ = 2 - 2 \\ = 0$$

## 21. Correct answer is [34].

Given: Tea is offered in cups of three different sizes.

The ratio of the prices of the smallest size to the medium size = 2 : 5

Let the prices of the smallest size and the medium size be  $2x$  and  $5x$ , respectively.

Let the price of the largest size be ' $n$ '.

Product of the prices of three different sizes = 800

$$2x \times 5x \times n = 800 \\ \Rightarrow n \cdot x^2 = 80 \\ \Rightarrow n = \frac{80}{x^2} \quad \dots(i)$$

Increased prices of the smallest size and the medium size are  $(2x + 6)$  and  $(5x + 6)$ , respectively.

Increased prices product = 3200

$$(2x + 6) \times (5x + 6) \times n = 3200$$

$$\Rightarrow (10x^2 + 42x + 36) \times \frac{80}{x^2} = 3200 \quad \{\text{from (i)}\} \\ \Rightarrow 10x^2 + 42x - 36 = 40x^2 \\ \Rightarrow 30x^2 - 42x - 36 = 0 \\ \Rightarrow 5x^2 - 7x - 6 = 0 \\ \Rightarrow (5x + 3)(x - 2) = 0 \\ \Rightarrow 5x + 3 = 0 \text{ or } x - 2 = 0 \\ \Rightarrow x = \frac{-3}{5} \text{ or } x = 2$$

Since the price can't be negative,

$$x = \frac{-3}{5} \text{ is discarded}$$

$\therefore$

$$x = 2$$

$$2x = 2 \times 2 = 4$$

$$5x = 5 \times 2 = 10$$

$$n = \frac{80}{x^2}$$

$$= \frac{80}{2^2}$$

$$= \frac{80}{4}$$

$$= 20$$

Hence, the sum of the original prices of three different sizes

$$\begin{aligned} &= ₹(4 + 10 + 20) \\ &= ₹34 \end{aligned}$$

**22. Correct answer is [12].**

Given:  $|1 + mn| < |m + n| < 5$ ,

Where  $(m, n)$  is a pair of integers

for  $|1 + mn| < |m + n|$

Considering the pair  $(0, 1)$ ,

$$\begin{aligned} |1 + 0 \times 1| &\not< |0 + 1| \\ |1| &\not< |1| \end{aligned}$$

Hence, the pair  $(0, 1)$  is discarded.

Considering the pair  $(0, 2)$

$$|1 + 0 \times 2| < |0 + 2|$$

$$|1| < |2|$$

Considering the pair  $(0, 3)$

$$|1 + 0 \times 3| < |0 + 3|$$

$$|1| < |3|$$

Considering the pair  $(0, 4)$

$$|1 + 0 \times 4| < |0 + 4|$$

$$|1| < |4|$$

Hence, for  $m = 0, n = 2, 3, 4$

Also, for  $n = 0, m = 2, 3, 4$  is possible

Thus, the possible pairs of integers  $(m, n)$  are

$(0, 2), (0, 3), (0, 4)$

$(2, 0), (3, 0), (4, 0)$

The given inequality is in the modules form.

Hence, for  $m = 0, n = -2, -3, -4$

and for  $n = 0, m = -2, -3, -4$  is also possible.

Thus, the further possible pairs of integers  $(m, n)$  are

$(0, -2), (0, -3), (0, -4),$

$(-2, 0), (-3, 0), (-4, 0)$

Hence, the required number of distinct pairs of integers  $(m, n)$  is 12.